INSTRUCTION MANUAL FOR

MODEL TCC-2000.

NO. 7679

Riken Denshi Co., Ltd.

理研電子株式会社

東京都目黒区祐天寺2丁目5番5号

電　話 (711) 6656 代

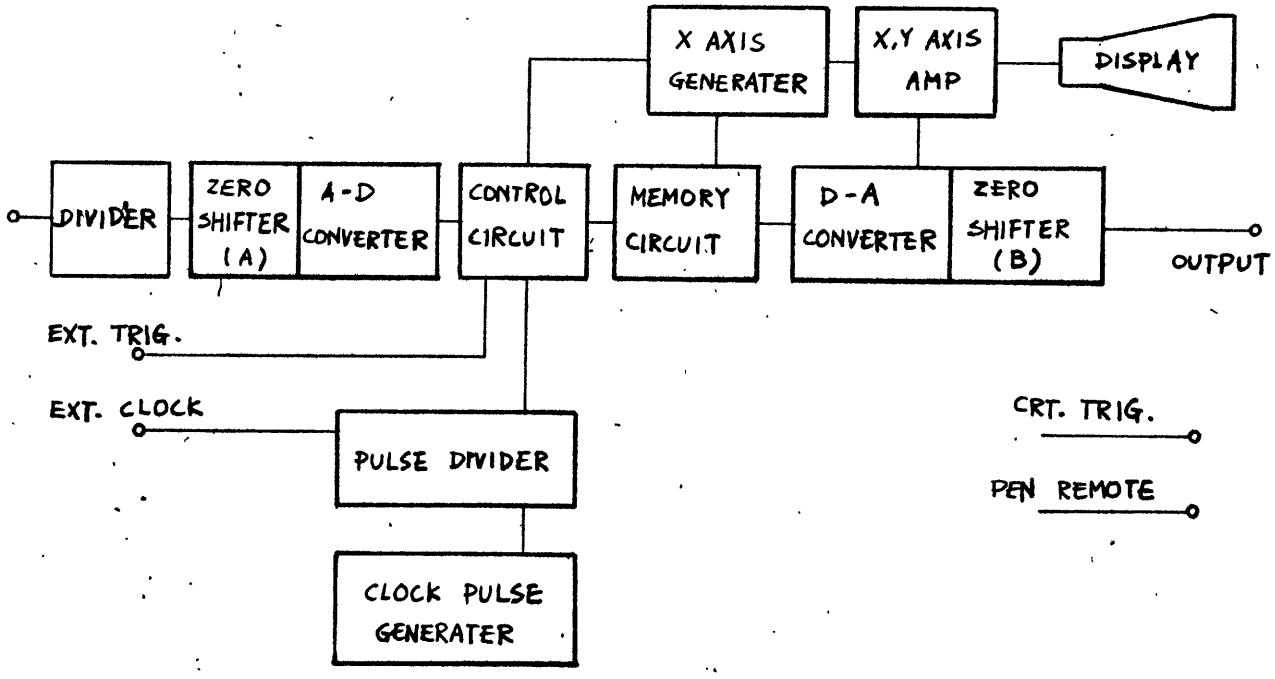
Model Name	TCC-1000, 2000	Section	

1. DESCRIPTION

Model TCC-1000 and -2000 Transient Time Converters are designed and manufactured to convert repetititive or single-shot analog phenomena into a digital quantity, store this digital quantity in a semiconductor memory and reproduce it at a built-in oscilloscope or record it at an external recorder by slowing down the read pulses.

The TCC-1000 has a memory capacity of 1024 words and the TCC-2000 has a memory capacity of 2048 words. Both models are equipped with a pretrigger setting dial capable of shifting the storage start period begore triggering. Moreover, since sweeping of the X-axis of the built-in oscilloscope is perfectly synchronized with the internal memory, memory address 1 is always set to the left end of the oscilloscope when reading the stored data (FIX state).

2. TCC-1000, TCC-2000 TRANSIENT TIME CONVERTER CIRCUIT CONSTRUCTION



Model Name	TC B. C. D -	Section	

2.1 Divider

The divider adjusts the input analog signal to magnitude suitable for the input of the A-D converter.

2.2 Zero shifter

A. Since the A-D converter only operated by a positive voltage, the zero shifter shifts the zero point to the position and region at which the converter is operated by both positive and negative voltages.

B. The zero shifted is provided at the output crcuit so that operation is performed at the same polarity as the input voltage after the digital quantity has been converted to an analog quantity.

2.3 A-D converter

This is a high-speed sequential comperison type A-D converter which converts 0 ~ 5V input voltage to natural binary 10 bit data (resolution 5mV) at a maximum sampling time of 5μS/word (2μS/word for high-speed type).

2.4 Control circuit

This circuit performs all the operations necessary for manual and automatic storage start, read and other operations.

2.5 Memory circuit

The A-D converted binary 10 bit digital data are stored in semiconductor memory elements.

Storage capacity is as follows:

Model	Storage capacity
TC.B. C. D-1000	1024 words
TC.B. C. D-2000	2048 words

2.6 D-A converter

The D-A converter converts the stored digital data read by the read pulses into analog data.

2.7 Clock pulse generator

This generator employs a crystal to generate a 2.4MHz (for 5μ sampling) square wave. The sampling time becomes 1/12 of this signal.

A 6MHz square wave is generated for 2μ sampling high-speed specifications.

Model Name	TC B. C. D -	Section	

2.8 Pulse divider

The pulse interval can be switched among the following 12 ranges:

Sampling time	Time required for storage	
	TC B.C.D-1000	TC B.C.D-2000
5μS (2μS)	5mS (2mS)	10mS (4mS)
10 " (4 ")	10 " (4 ")	20 " (8 ")
25 " (10 ")	25 " (10 ")	50 " (20 ")
50 " (20 ")	50 " (20 ")	100 " (40 ")
100 " (40 ")	100 " (40 ")	200 " (80 ")
250 " (100 ")	250 " (100 ")	500 " (200 ")
500 " (200 ")	500 " (200 ")	1Sec (400 ")
1mS (400 ")	1Sec (400 ")	2 " (800 ")
2.5 "(1mS)	2.5 "(1Sec)	5 " (2Sec)
5 " (2 ")	5 " (2 ")	10 " (4 ")
10 " (4 ")	10 " (4 ")	20 " (8 ")
25 " (10 ")	25 " (10 ")	50 " (20 ")

Values in ( ) are for high-speed specifications.

2.9 X-axis generator

The X-axis generator generates a voltage so that sweep of the X-axis is started and the X-axis is swept at a speed matched to the WRITER or FIX state.

2.10 X,Y axis amp

This amplifier amplifies the X and Y axis voltage for display at the oscilloscope.

2.11 Display

The X-axis is swept in synchronization with the memory and the Y-axis displays the OUTPUT voltage on the CRT.

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3. SPECIFICATIONS

	TCB- TCC- 1000 TCD-	TCB- TCC- 2000 TCD-
Memory capacity	1024 words	2048 words
Input impedance	2 MΩ constant	
Sampling time	12 steps 5, 10, 25, 100, 250, 500 µS 1, 2.5, 5, 10, 25 mS/word For high-speed type: 2, 4, 10, 20, 40, 100, 200, 400 µS 1, 2, 4, 10 mS/word	
Recording time	5, 10, 20, 50, 100 mS/word	
Output	± 2.5 V	
Measuring ranges	10 steps ± 50, ± 100, ± 500 mV ± 1, ± 2, ± 5, ± 10, ± 50 V/ full scale	
Resolution	10 bits	
Response	5 µS ± full scale (200 KHz) (2 µS ± full scale for high-speed type)	
Accuracy	± 0.5 %	

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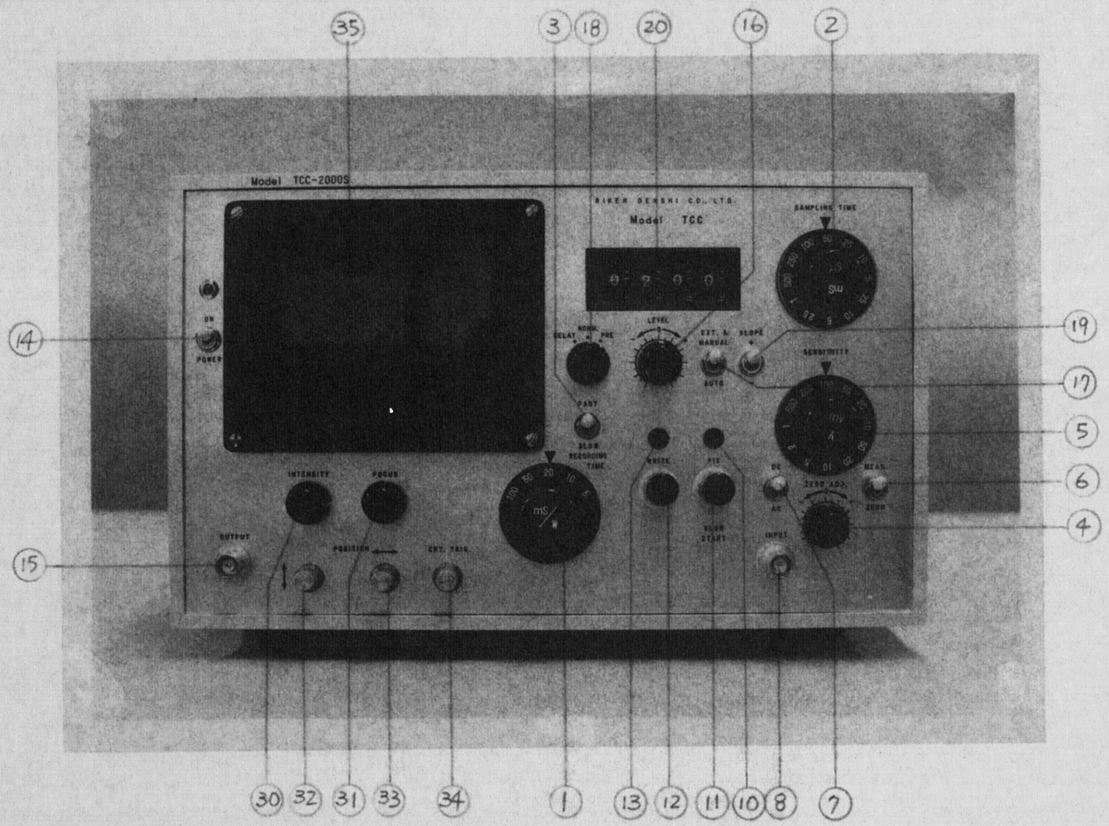
① Recording time selector
② Sampling time selector
③ Pulse speed switch
④ Zero adjuster
⑤ Input sensitivity select switch
⑥ Input switch
⑦ DC-AC selector switch
⑧ Input connector
⑨ Trigger channel switch (TCD only)
⑩ FIX lamp



⑪ FIX switch
⑫ WRITE switch
⑬ WRITE lamp
⑭ Power switch
⑮ Output connector
⑯ Trigger level adjuster
⑰ Trigger selector switch
⑱ Trigger mode switch
⑲ Slope switch
⑳ Trigger setting dial

㉚ Intensity adjuster
㉛ Focus adjuster
㉜ Vertical position adjuster
㉝ Horizontal position adjuster
㉞ C.R.T. trigger level adjuster
㉟ C.R.T. (cathode ray tube)

Model Name	TCC	Section	

21a External trigger connector

21b External mode SW.

22 CRT. trigger Output connector

23 Pen remote Output connector

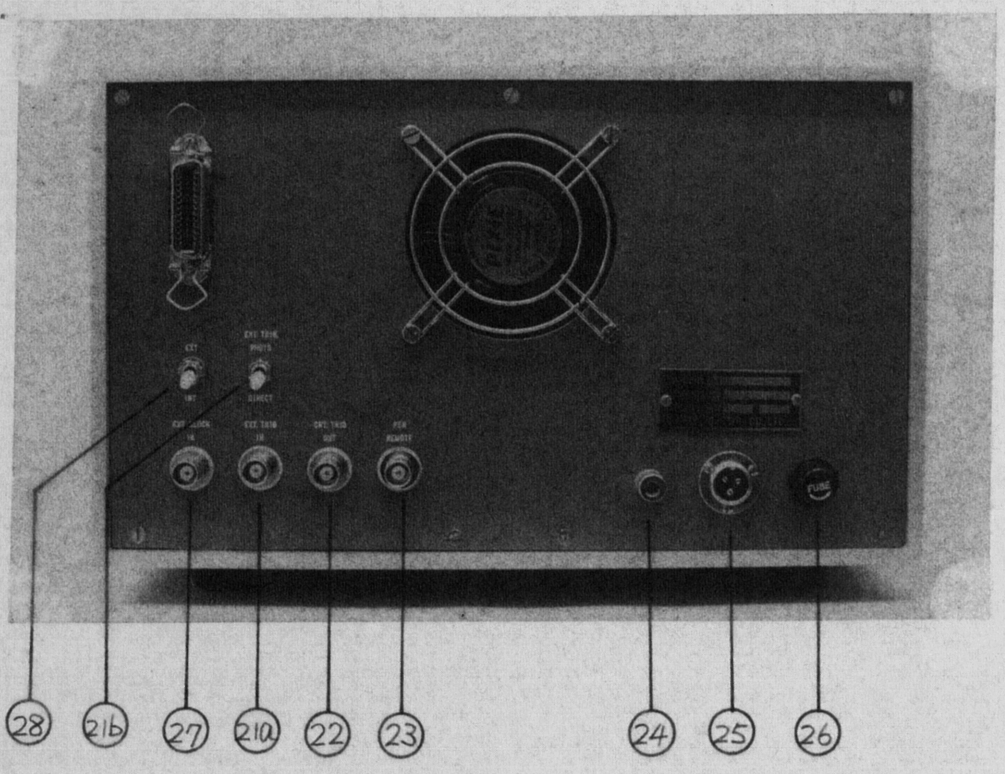
24 Ground terminal

25 AC Power connector

26 Fuse holder

27 EXT. Clock connector

28 EXT = INT. Clock SW.



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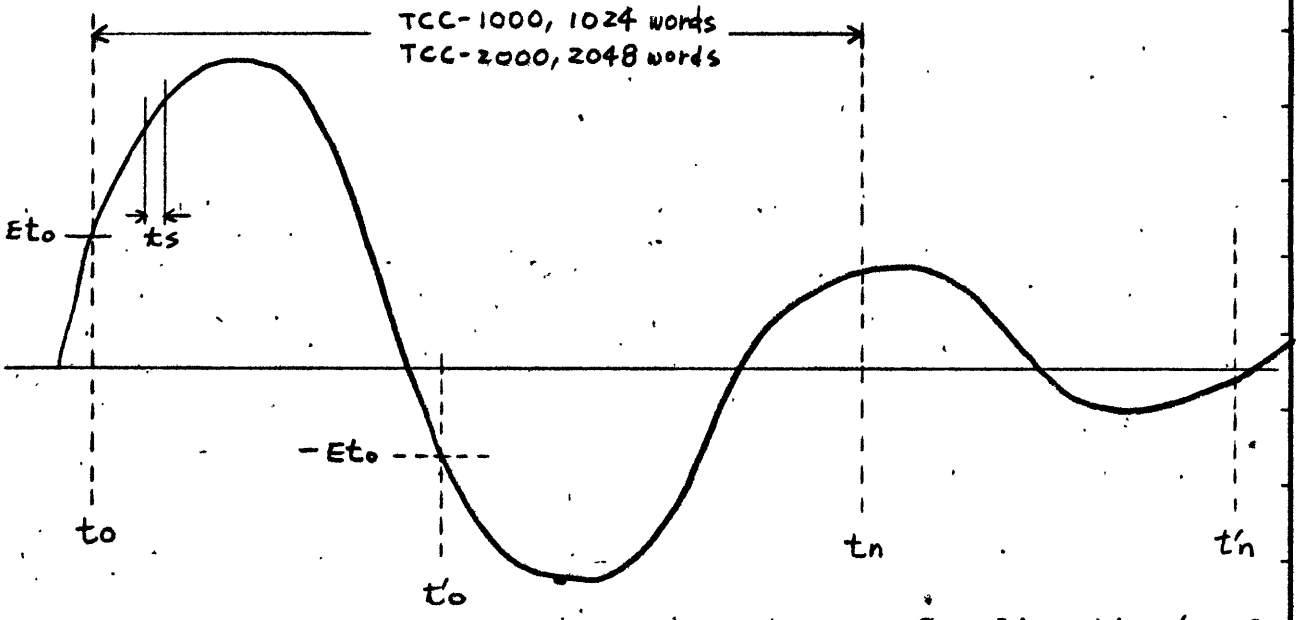
4. PRINCIPLES OF OPERATION

4.1 Memorization Operation

For example, when a single-shot high-speed waveform such as that shown below is memorized, TRIGGER is set to AUTO and the level control is set to the storage start voltage level (Eto).



ts .... Sampling time/word

The memory gate is opened by the input signal and the sequential input analog quantity is converted to a digital quantity and stored in the semiconductor memory by the clock pulse. When the inherent number of memory words (1024 and 2048 words for the TC-1000 and TC-2000, respectively) has been memorized, the gate is closed and the memorized quantity is maintained. The memorized quantity can be observed from the output terminals with an oscilloscope, etc.

The memorized data are not cleared until the power is turned off or the WRITE switch is depressed.

However, when the trigger start voltage is negative, for example, when -Eto, memorization is started at to, the data corresponding to the inherent number of memory elements are memorized and the memorized data are maintained. The relation tn - to = t'n - t'o between to, t'n t'o tn is shown in the figure.

The memory can also be operated by a pulse signal (TTL

level) from the outside. But in the case of repetitive waveforms, memorization may also be started by setting the trigger mode to MANUAL and depressing the FIX switch.

4.2 Reading Operation

The high-speed analog phenomena can be observed at the oscilloscope by setting the pulse speed switch to FAST and depressing the FIX switch.

When the pulse speed switch (3) is set to SLOW and the FIX switch (11) is depressed to the case of a device having a slow tracking speed, such as a recorder, the composite analog signal can be read at 5 reading speeds from 5mS/word to 100mS/word.

5. DESCRIPTION OF CONTROLS

5.1 WRITE (pushbutton) switch (12)

When this switch is depressed, all the memorized data are cleared and the input waveform is read from the output terminal. (To be precise, the data of the preceding sampling time times the inherent number of memory words are read.)

5.2 FIX (pushbutton) switch (11)

A) WRITE lamp (13) lighted

Pulse speed switch (3).....FAST
Trigger selector switch (17).....MANUAL
Trigger mode switch (18).....NORM

When the FIX button is depressed under this state, a single trigger pulse is generated and memorization is started. When the number of inherent words of the memory have been memorized, the converter is immediately set to the READ mode and the memorized waveform appears at the output terminals in the form of a repetitive waveform.

B) FIX lamp (10) lighted

Pulse speed switch (3).....SLOW
(Other switches are not used in this operation.)

When the FIX button (11) is depressed under this state, the memorized waveforms are read from memory address 1 and appear at the output terminals at the slow reading speed and the converter is then halted.

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However, the memory address becomes 1 at the point at which the trigger is applied.

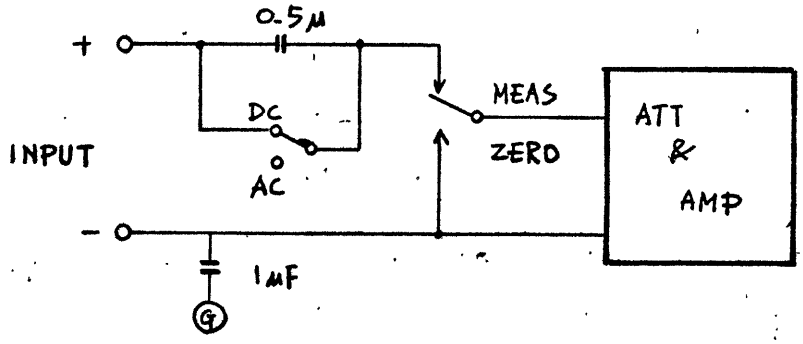
5.3 FAST-SLOW selector switch (pulse speed switch) (3)

When this switch is set to the FAST position, the read and store pulse speed becomes fast. This position is used when memorizing data or when observing the waveform on the oscilloscope in the WRITE mode.

When this switch is set to the SLOW position, the read pulse becomes slow. This position is used when applying the output to a recorder, etc.

5.4 Input (selector) switch (6)

When this switch is set to the MEAS position, the amplifier is connected to the + input terminal, and when it is set to the ZERO position, the amplifier is connected to the - input terminal.



5.5 DC-AC selector switch (7)

This switch is used to detect an AC voltage superimposed on the DC voltage.

5.6 ZERO ADJ (4)

This dial is used to set the zero point the amplifier and to shift the zero point on the recording.

5.7 SENSITIVITY (5)

This dial is used to adjust the input signal to a suitable operating voltage for the amplifier and A-D converter.

5.8 SAMPLING TIME (2)

This dial is used to set the clock pulse interval considering the input dignal waveform and the required resolution.

5.9 TRIGGER MODE

A) EXT & MANUAL-AUTO selector switch (17)

(Trigger selector switch)

MANUAL.....The FIX operation is performed manually or by external trigger.

AUTO.....The FIX operation is performed by the input signal.

MANUAL is primarily used for repetitive phenomena and AUTO is used for single-shot phenomena.

B) Trigger channel switch (9) (Model TCD only)

Since the Model TCD has 2 channels, this switch is used to specify whether the converter is operated by CH1 or CH2 during AUTO operation.

C) SLOPE switch (19)

This switch is set to the (+) position for waveforms which start to rise in the positive direction of the signal and is set to the (-) position for waveforms which start from the negative direction of the input signal when operated by AUTO TRIG. (Refer to the below figure.)

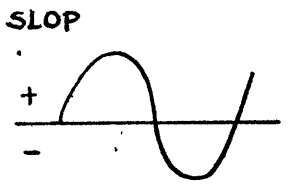


Fig. 1

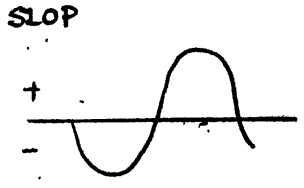


Fig. 2

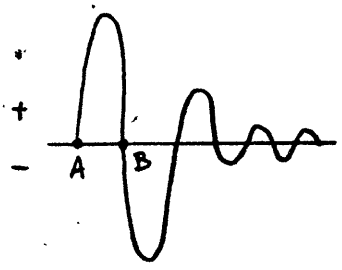


Fig. 3

In Fig. 3, the SLOPE switch is set to the (+) position when the converter is started from point A and is set to the (-) position when the converter is started from point B.

D) TRIGGER LEVEL ADJ (16)

This knob is used to set the operating point to an arbitrary position on the rise or fall of the input signal when the converter is operated in the AUTO TRIG mode.

(The level can be set to any arbitrary position over full scale by adjusting this dial (16).)

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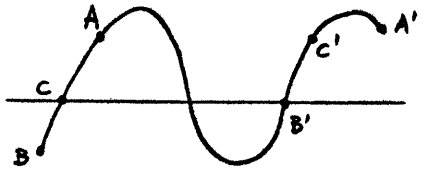
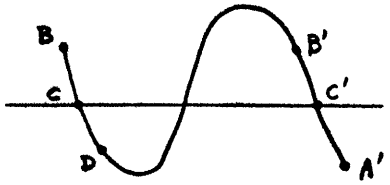
SLOP ⊕ LEVEL ⊕ START A
" ⊕ " ⊖ " B
" ⊕ " 0 " C



SLOP ⊕ LEVEL ⊖ START A
" ⊖ " ⊕ " B
" ⊖ " 0 " C



E) Trigger mode switch (18)

This switch is used to select either memorization after a certain period of time has elapsed after the phenomena of the previously issued WRITE command or simulataneous memorization with issuing of the WRITE command signal.

That is,

PRE: Memorization is performed from the phenomena of the previously issued WRITE command.

NORM: Memorization is performed simultaneously with issuing of the WRITE command.

DELAY: Memorization is performed after a certain time has elapsed after the phenomena of the previously issued WRITE command.

F) Trigger setting dial (20) (Digital switch)

The lead or lag time when memorization is started by the trigger signal is set at these switches.

The number of words is indicated.

5.10 Rear panel functions and use

A) CRT TRIG

The TTL level EXTERNAL TRIGGER for an oscilloscope is output from the CRT TRIG terminal on the rear panel. When the output of the transient converter is observed with an oscilloscope, memory address 1 can be clearly indentified by applying the output of this terminal to the EXT terminal of the oscilloscope without applying a trigger with output analog phenomena.

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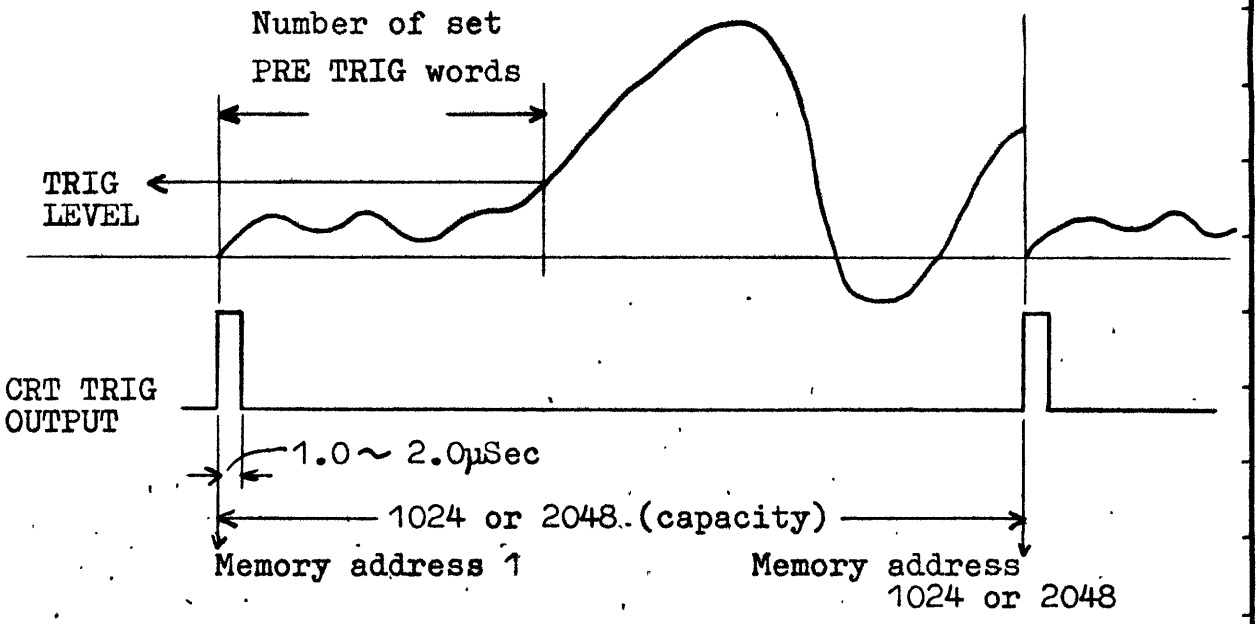
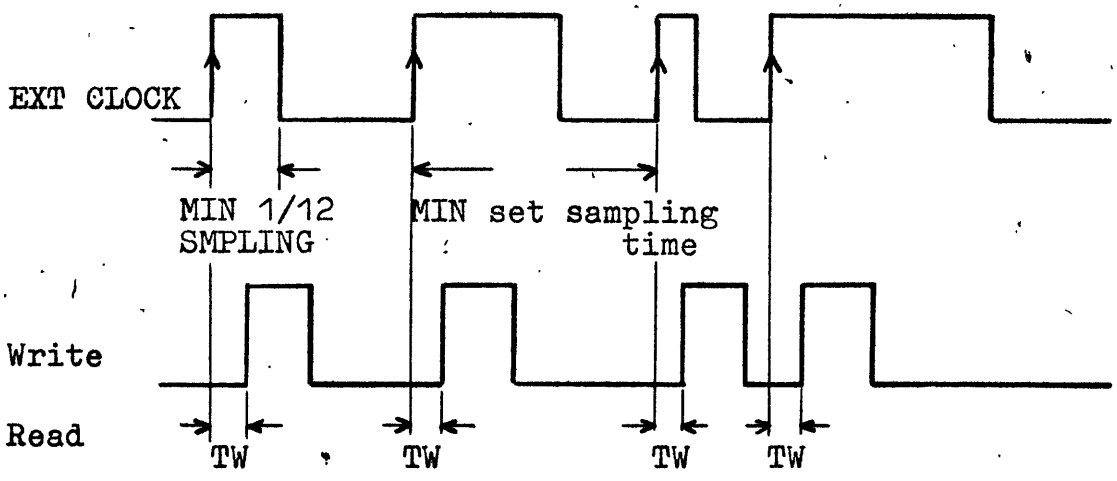


B) EXT CLOCK

Write and read (pulse speed switch (3) set to FAST) can be performed by setting the EXT CLOCK switch on the rear panel to the EXT position and applying a TTL level input to the EXT CLOCK input terminal.

The read/write timing is given in the below figure.



TW: Set sampling time.

However, one word is written and read by one edge. Moreover, operation is performed at the rise of the pulse.

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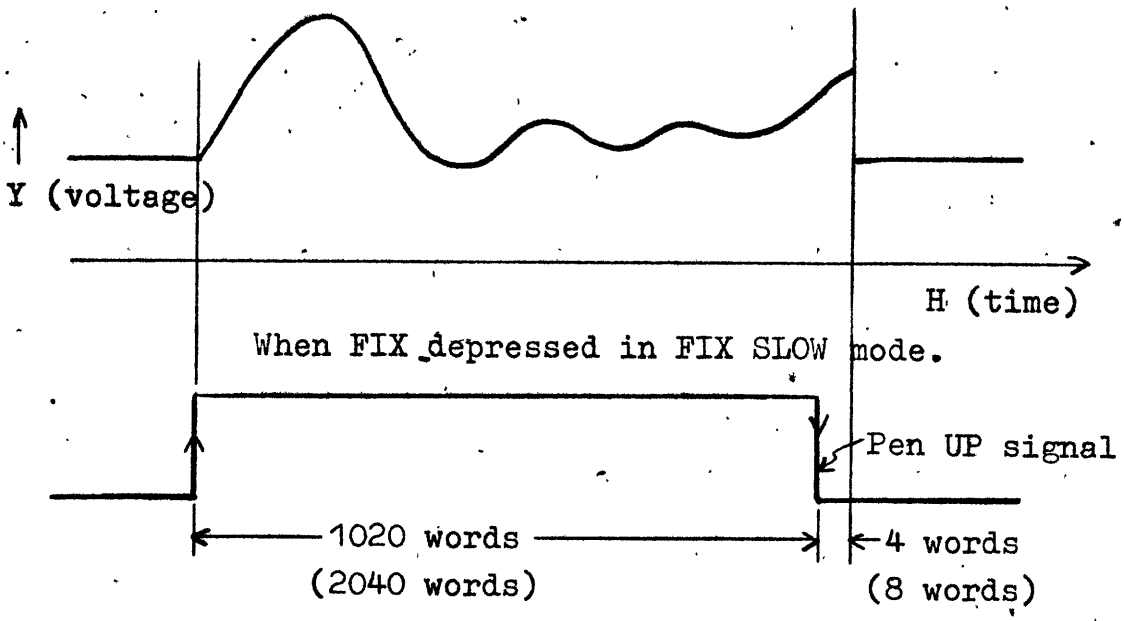
C) PEN REMOTE

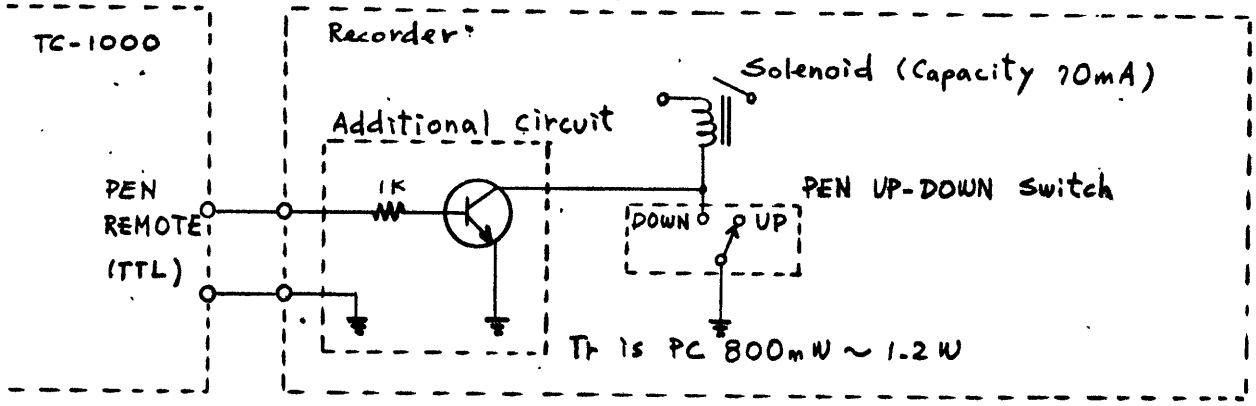
The pen of a pen recorder with a pen remote function can be lifted and lowered by the TTL level signal from the PEN REMOTE output terminal on the rear panel. When the FIX switch is pushed in the FIX, SLOW state, the data from memory address 1 to memory address 1020 (address 2040 for TC-2000) are output as illustrated below. Moreover, the four word portion is the delay at which the pen is lifted.



The FIX SLOW mode is the state in which the FIX lamp is lighted and the pulse speed switch (3) is set to the SLOW position.

PEN REMOTE precautions

When the PEN REMOTE control input of the recorder is TTL (transistor-transistor logic, 0 ~ +5V IC input) operated, add the circuit shown below to the recorder.



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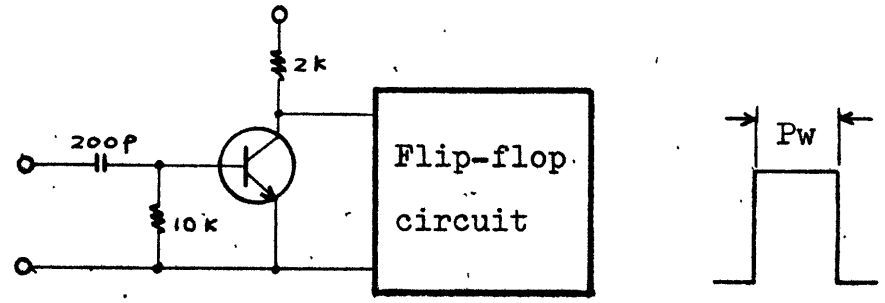
D) EXT trigger terminal (21)

This terminal is provided to start memorization by means of an external signal and is operated by the top of a TTL input.



This terminal is operated if the input pulse width PW is greater than 1μ sec.

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5.11 DISPLAY

A) INTENSITY (30)

This knob adjusts the intensity of the phenomena (analog voltage read from the memory) on the monitor CRT.

B) FOCUS (31)

This knob adjusts the focus of the CRT.

C) POSITION ↕(32) ↔(33)

These knobs adjust the ↕ ↔ positions on the CRT.

D) CRT TRIGGER (34)

This knob applies the trigger to the output phenomena and sweeps the X-axis (horizontal axis) in the WRITE mode.

However, the X-axis is swept without regard to the output phenomena in the FIX state.

E) Monitor CRT (35)

This CRT is used to monitor the phenomena read from the memory.

The Y-axis is divided into 4 divisions on either side of the center of the full scale voltage of each range displayed in the vertical direction.

The relation between the Y-axis and the output voltage is 2.5V/4 divisions.

The X-axis is not swept when the CRT trigger is not applied in the WRITE mode.

The inherent storage capacity is 10DIV in the FIX mode (FIX lamp lighted).

(1024 words/10 divisions for TCC-1000 and 2048 words/10 divisions for TCC-2000.)

Memory address 1 always appears at the left side of the CRT.

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6. OPERATING INSTRUCTIONS

6.1 Confirm the following before connecting the AC line to the power connector.
AC power line the correct voltage?
Input switch (6).....ZERO
EXT-INT switch (28).....INT (rear panel)
FAST-SLOW switch (3).....FAST

6.2 When the power switch (14) is set to the ON position, the transient converter is immediately placed in the WRITE state and the WRITE lamp is lighted. (However, 10 20 seconds is required before the CRT of the TCC-1000,2000 becomes operative.)

6.3 Connect the oscilloscope, etc. to the output terminal (15) and adjust the ZERO ADJ knob (4) so that the WRITE lamp (13) is lighted and the output voltage becomes zero. (However, since the TCC-1000, 2000 contain a built-in CRT, connection of an external oscilloscope is unnecessary.)

6.4 Connect the unknown circuit to the input terminals.

6.5 Set the SENSITIVITY dial (5) to a suitable value, considering the magnitude of the anticipated waveform. (Input impedance is 2MΩ constant.)

6.6 Sampling time setting
Set the sampling time according to the waveform to be memorized.

6.7 Memorizing repetitive waveforms
A) MANUAL-AUTO switch (17).....MANUAL (Trigger selector SW.)
B) FAST-SLOW switch (3).....FAST (Pulse speed SW.)
C) Trigger mode switch (18).....NORM
D) Input switch (6).....MEAS
E) DC-AC switch (7).....DC
F) When the WRITE switch (12) is depressed, the WRITE lamp (13) will light.
G) When the FIX switch (11) is depressed, memorization is started by the trigger pulse, the inherent storage capacity is memorized, the end pulse is generated and the memorized output is containuously output from the output terminal.
This output can be easily observed with an oscilloscope, etc.

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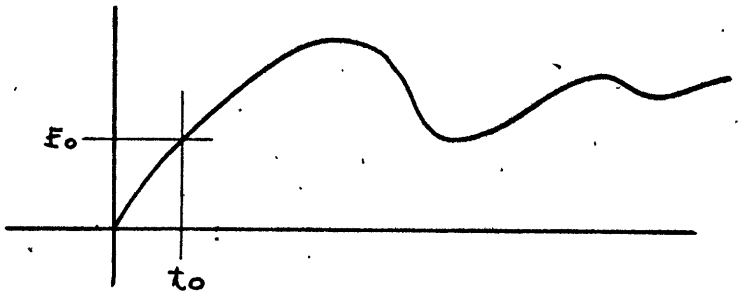
H) When the FAST-SLOW switch (3) is set to the SLOW position and the FIX switch (11) is depressed when recording with a recorder, the memorized data are reproduced at a speed within the tacking speed of the recorder.

I) The reproduced data are automatically stopped when the inherent storage capacity of the memory has been read.
The reading speed when a recorder is used can be switched from 5m/s to 100m/s per word in 5 steps by means of the recording time dial (1).

6.8 Memorizing single-shot waveforms

A) MANUAL-AUTO switch (17).....AUTO (Trigger selector SW.)
B) FAST-SLOW switch (3).....FAST (Pulse speed SW.)
C) Trigger mode switch (18).....NORM
D) Input switch (6).....MEAS
E) DC-AC switch (7).....DC
F) When the WRITE switch (12) is depressed, the WRITE lamp (13) is lighted.
G) Set the trigger one-shot voltage at the trigger level adjaster dial (16).
Decide the + or - polarity of the trigger one-shot voltage.



(NOTE) A) If the trigger one-shot voltage is too low, triggering may be performed by noise in the input signal.
B) Trigger switch + and - mean the differentiated value of the measured waveform.

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9.6 When trigger applied by external pulse signal

A) Trigger switch (17).....MANUAL (Trigger selector SW.)

B) Pulse switch (3).....FAST (Pulse speed SW.)

C) Depress the WRITE switch (12) and confirm that the WRITE lamp (13) is lighted.

D) Writing and reading are possible by applying a pulse signal to the EXTERNAL terminal on the rear panel.

E) When the output is connected to a recorder, set the pulse speed switch (3) to SLOW and depress the FIX switch.

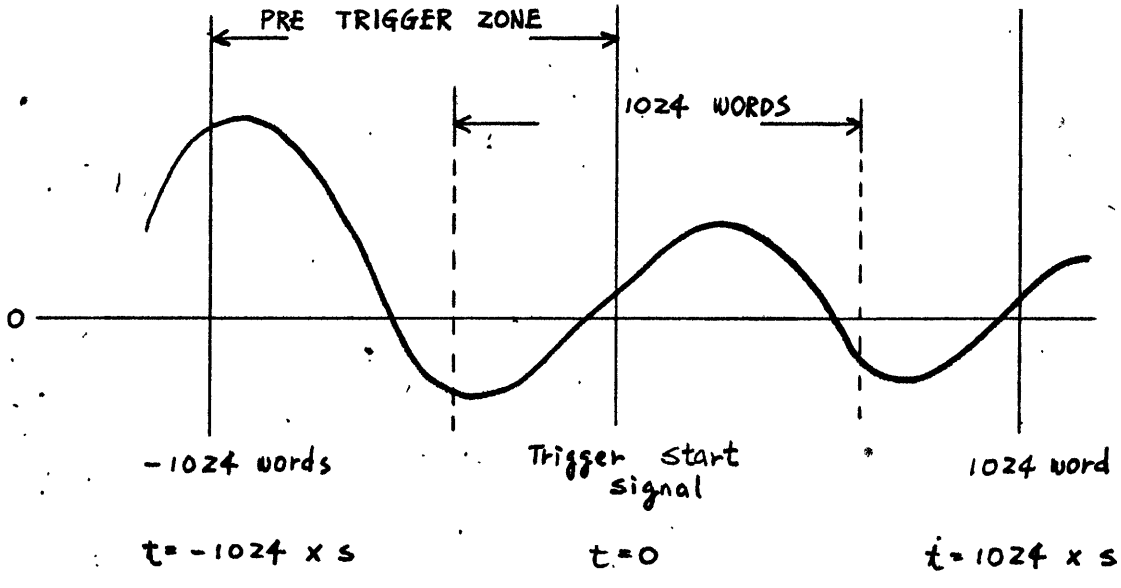
9.10 Pretrigger

(Function)

This circuit is used when desiring to observe the waveform before the trigger is applied.

* In other words, if the setting dial is set to 0000, memorization is started from the present time and 1024 words are memorized.
* If the setting dial is set to 0500, memorization is started from the state before word 500 and 1024 words are memorized.
* If the setting dial is set to 1024, memorization is started from the state before word 1024 and 1024 words are memorized. That is, the memorization operation stops started at the present time.

This is diagrammed below.



Where s = sampling time per word

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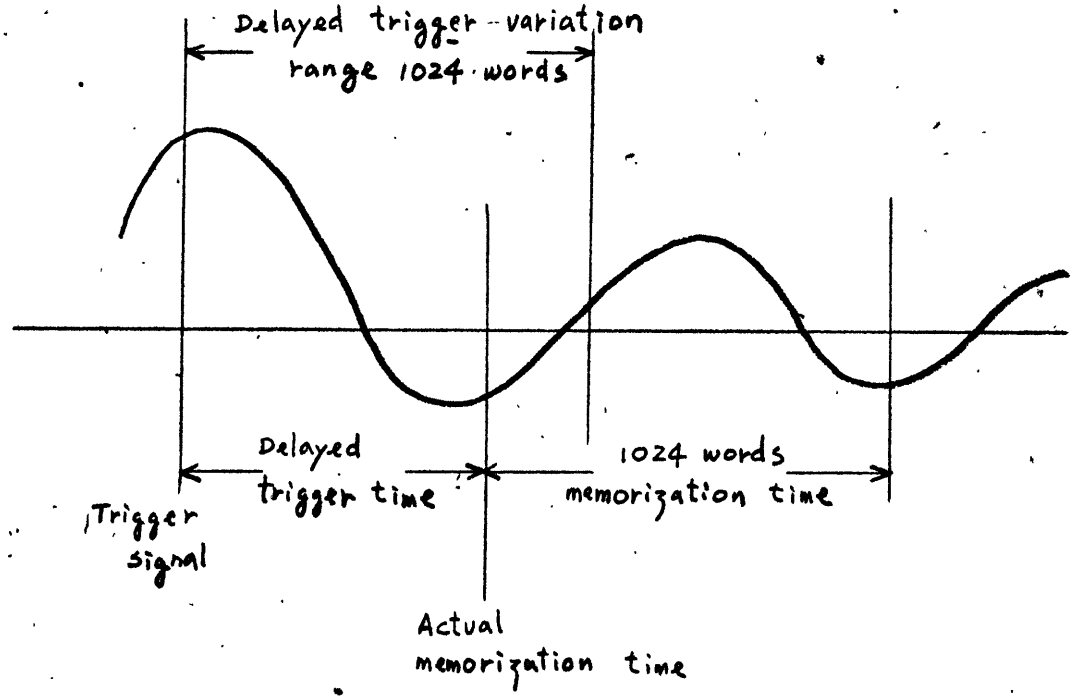
6.11 Delaied trigger

(Function)

This is used when desiring to start memorization after the time set beforehand has elapsed after the trigger start signal has been generated.

In other words, in the case of 1024 memory capacity,

* when the setting dial is set to 0000, memorization is started from the present time when the trigger command signal is generated and 1024 words are memorized.
* when the setting dial is set to 0500, memorization is started after the time required to memorize 500 words has elapsed after the trigger command signal has been issued and 1024 words are memorized.
* when the setting dial is set to 1024, memorization is started after the time required to memorize 1024 words has elapsed after the trigger command signal has been issued and 1024 words are memorized.



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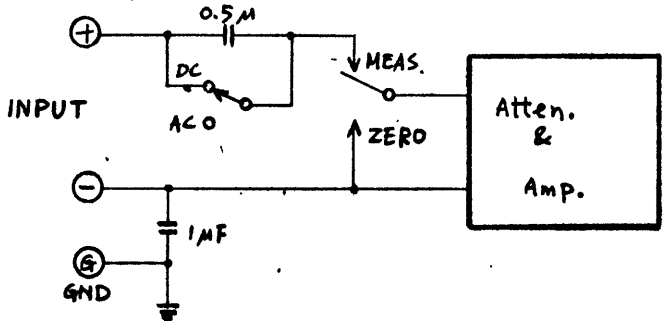
6.12 Operation

1. When the trigger mode switch (18) is set to the NORM position, memorization of the input waveform is started by the trigger signal (AUTO, MANUAL, EXTERNAL) without ragard to the setting of the setting dial and the prescribed capacity (1024 words) is memorized.
2. When the trigger switch (18) is set to the PRE position, the memorization start point can be shifted between 0 and 1024 words before the trigger start signal by means of the setting dial.
3. When the trigger switch (18) is set to the DELAY position, memorization is started after a certain fixed period of time has elapsed and 1024 words are memorized.
   The delay time can be freely adjusted from 0 to 1024 words by means of the digital switch.

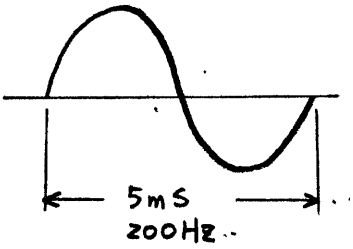
7. PRECAUTIONS

7.1 The input circuit of the converter is wired as illustrated below. Therefore, apply the input signal between the (+) and (-) terminals and not between the (+) and GND terminals.
Since the input is floated from ground through 1μF and the amplifier is a DC amplifier, the data will not be directly effected even if DC100V, AC20V or other voltages are applied between the (-) and GND terminals.

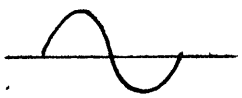
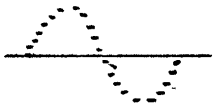


Model Name	TC B. C. D -	Section	

7.2 The time interval between samplings is a maximum 5μsec. Consequently, a 200Hz waveform can be memorized at one period when this is applied to a sine wave.
Therefore, when 1024 words are memorized at a 5μsec sampling time, the sampling interval of one period becomes longer as the frequency becomes higher.



That is, at 2kHz, 1 period sampling becomes 100 points and at 20kHz, sampling of one period becomes 10 points. This can be performed by observing the waveform with an oscilloscope, etc., but recording with a recorder may also be possible.

	1 period approximately 1000 points 	1period approximately 10 points 
2 μ sec	500 Hz	50k Hz
5 μ sec	200 Hz	20k Hz

7.3 There is an external clock-internal clock switch (28) on the rear panel. However, the converter woll not be operated if this switch is not set to the internal clock side when an external clock is not used.

Model Name	TC B. C. D -	Section	

8. TROUBLE SHOOTING

8.1 Output waveform disturbed

When the output waveform is not a true sine wave when the input is a normal waveform, for example, a sine wave, the memory elements used in the memory circuit are faulty.

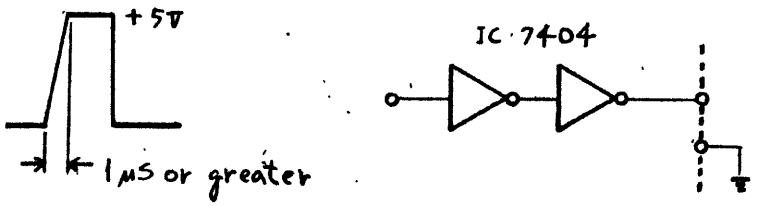
8.2 When the converter is not placed in the FIX state even when the trigger signal enters in the WRITE state.

A) Not placed in the FIX state even when the FIX button is depressed in manual trigger operation.
(CAUSE) Control circuit faulty.

B) When not placed in the FIX state in AUTO trigger operation.
Check if the trigger level is suitable and if the +, - slope is suitable.

C) Not placed in the FIX state in external trigger operation.

Since the external trigger is applied by the rise of the pulse, check the rise time and waveform of the trigger pulse.
When the rise of the pulse exceeds 1usec, shape the waveform by inserting a two-stage TTL inverter.



Anticipated trigger waveform

D) Placed in the FIX state before the external trigger pulse entered in external trigger operation.
(CORRECTIVE ACTION)
The major cause of this trouble is noise entering at the external trigger input terminal. Therefore, take the necessary action to eliminate this noise.

Model Name		Section	

Trouble shooting of the mismemorizing action due to the noise which superposing on the external triggering pulse.

When memorizing by external triggering pulse which control the time for memorization, in case direct coupling some times begin to memorize by supperposing noise on external tiggering pulse exapt regular command pulse.

All most all this misworking can be rejected by setting photo-coupler just before control circuit.

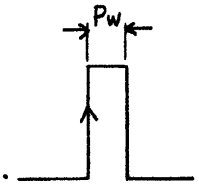
The pulse width of each coupling of direct and photo are indicated followingly.

(A) Direct coupling

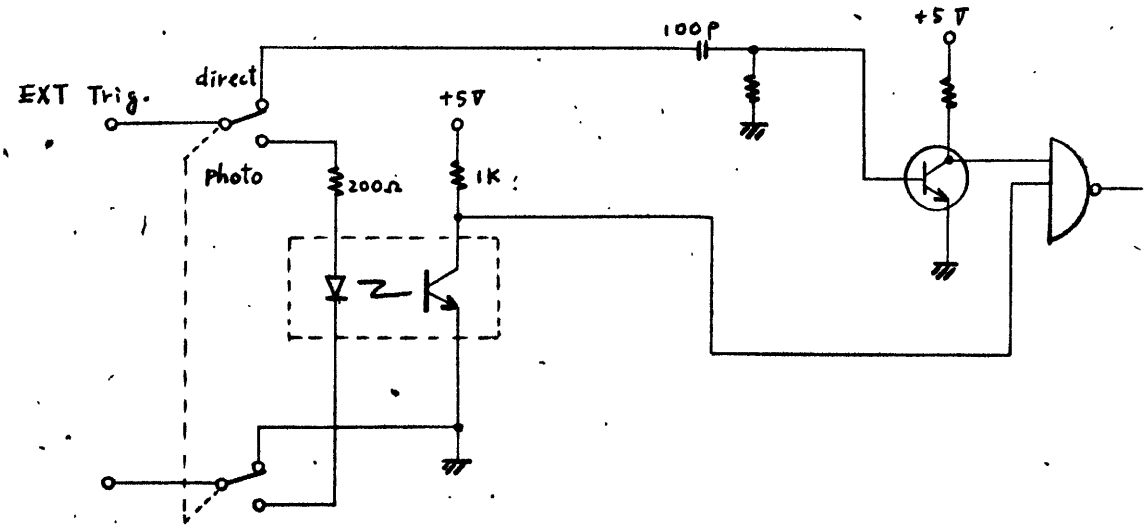
is suited $60\ nS < Pw < 10\ \mu S$

(B) Photo coupling

$5\ \mu S < Pw$



"Note" Triggering action is performed by positive going edge of pulse.



RIKEN DENSHI Co., Ltd. No._____

Model Name		Section	

PERFORMANCE DATA

Date 1976 - 11 - 24

Time axis: Time base Crystal controlled 2.4MHz (high-speed type 6MHz)

Specification	2.4 (6.0)MHz	Temp. coefficient 2×10^{-5}/C
Indicated value	2.4 MHz	3×10^{-6}/C

(NOTE) The deviation and temperature characteristic are considred to be the same as the reference frequency on all ranges.

Voltage axis: Analog output Frequency response and DC accuracy

Input Range	CH - 1 Indicated value	CH - 1 Frequency response	CH - 2 Indicated value	CH - 2 Frequency response
50 mV	+ 2.490 V	100KHz	+ V	KHz
	- 2.510 V		- V	
100 "	+ 2.490 V	700 "	+ V	"
	- 2.510 V		- V	
200 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
500 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
1 V	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
2 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
5 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
10 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
20 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	
50 "	+ 2.495 V	1.000 "	+ V	"
	- 2.505 V		- V	

SCHEMATIC MAIN PARTS LIST

MODEL TCC-1000(S).2000(S)

Riken Denshi Co., Ltd.

理研電子株式会社

東京都目黒区祐天寺2丁目5番5号

電 話 (711) 6656 代

	T C C - 1000(S), 2000(S) MAIN UNIT LISTS			
Item	Unit	Printing board	Function	Specifications
1	Input Sensitivity Assembly	P-291H	* Adjustment of input level * Zero shift	±10, 20, 50, 100, 200, 500 mV ±1, 2, 5, 10, 20, 50 V OUTPUT ±2.5 V Input impedance 1 M ohms
2	Sampling time Assembly	P-388B P-342	* Clock pulse generator * Pulse divider	5, 10, 20, 50, 100, 200 µS/word 1, 2, 5, 10, 20 mS/word
3	Recording time Assembly	P-301 P-342	* Pulse divider	5, 10, 20, 50, 100 mS/word
4	Pre trigger Assembly	P-314C	* Counting of clock * Control of triggering interval from command pulse by mean of digital switch	BCD Up Down counter
5	Controll circuit	P-293J	* All control for menorization and read out	
6	A-D converter		* 10 bits binary	5 µS/word high speed 2 µS/word

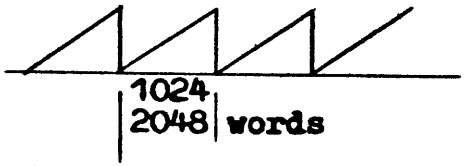
Model Name: TCC-1000(S), 2000(S)

Section: Main Unit Lists

RIKEN DENSHI Co., Ltd.

No.

T C C - 1000(S), 2000(S) MAIN UNIT LISTS

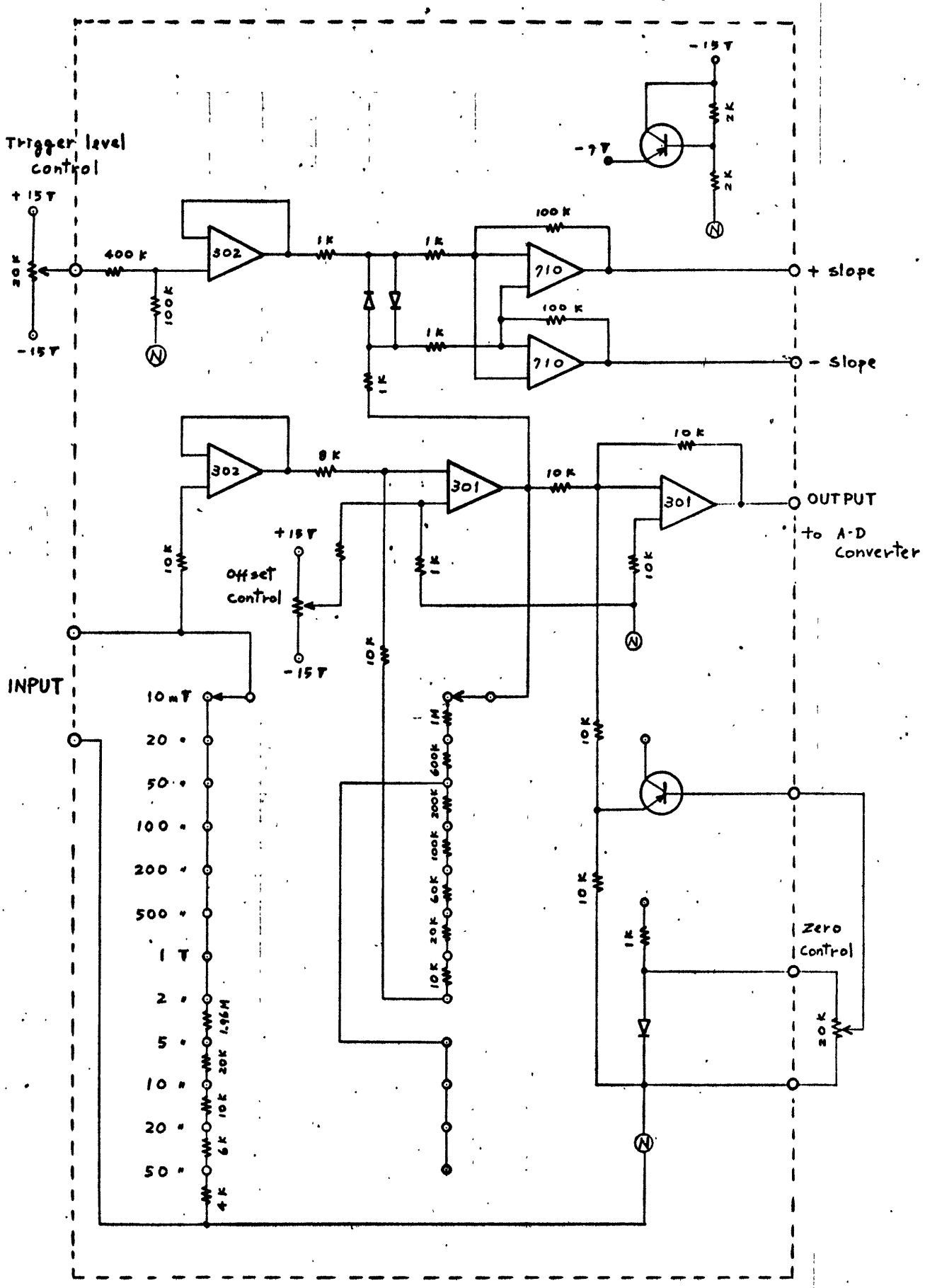
Item	Unit	Printing board	Function	Specifications
7	Memory	P-383 P-468	* Memorization for static shift register	P-383 2000 words binary 10 bits P-468 1000 words binary 10 bits
8	Zero Shift for output	P-295A	* Bias for zero shift of the output of D-A converter	
9	Regulated power supply unit + 5 V	P-212C	* Power supply for TTL IC	5 V 1.3 A 1.5 A (2000W)
10	Regulated power supply unit ± 15 V	P-292B	* Power supply for linear IC A-D converter	± 15 V 50 mA, + 10 V 50 mA - 12 V 50 mA
11	C.R.T. Generator (X axis)	P-352A		
12	C.R.T. Amplifier (X,Y Axes)	P-311A		
13	Power Supply C.R.T. use	P-349		- 1500 V + 180 V

Model Name: TCC-1000(S),2000(S)

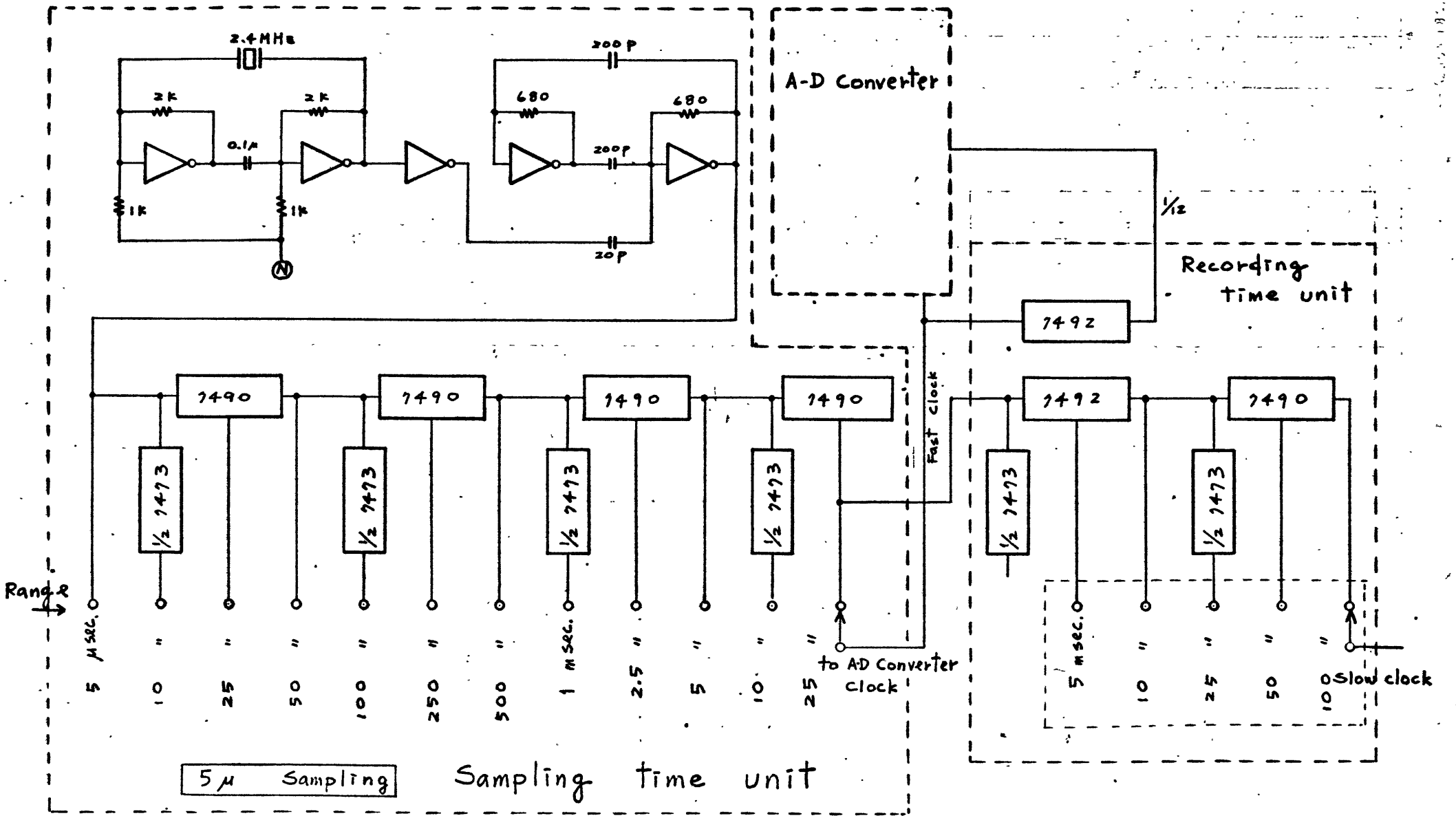
Section: Main Unit Lists

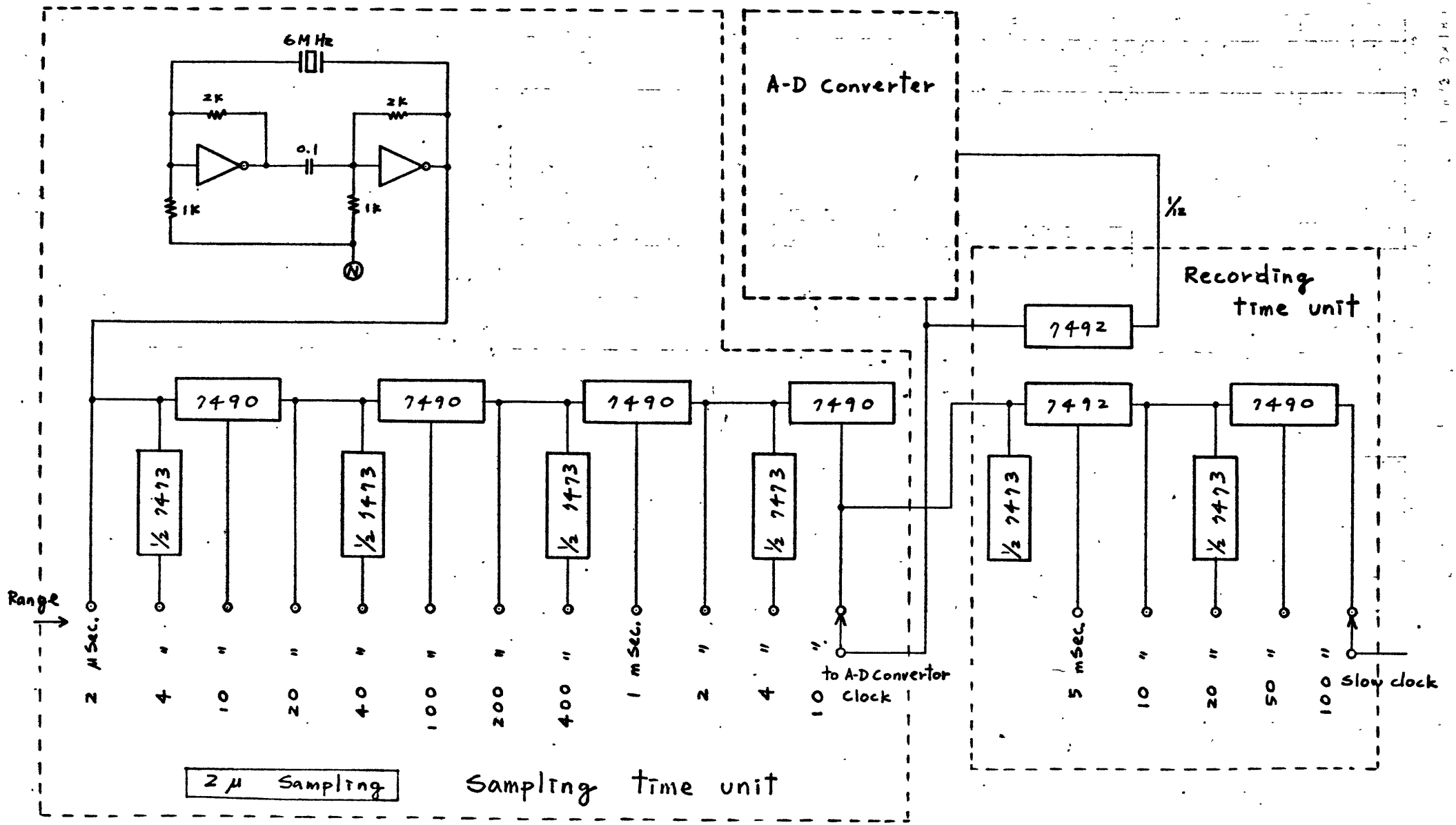
RIKEN DENSHI Co., Ltd.

No.



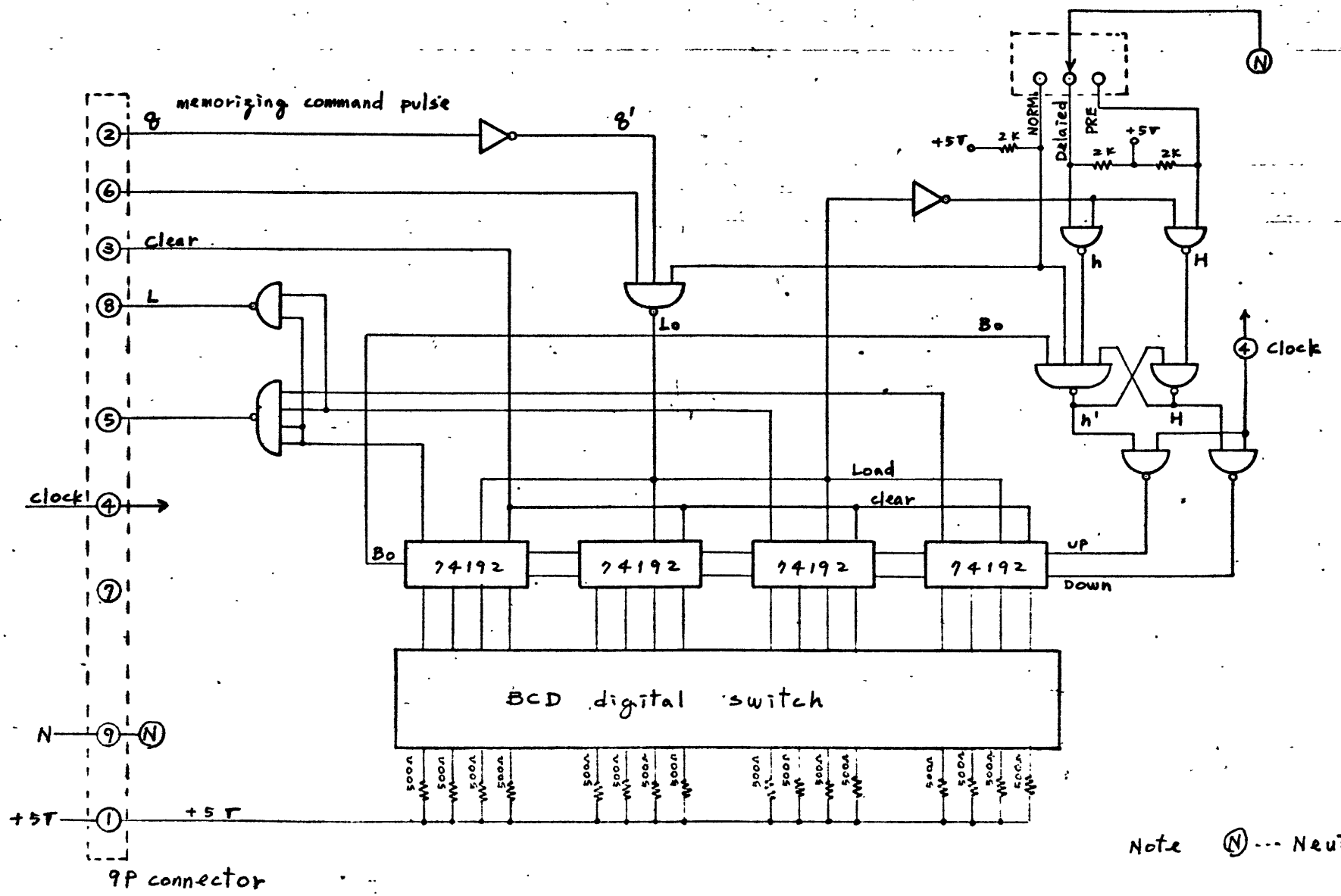
TCB, TCD · Attenuator Unit

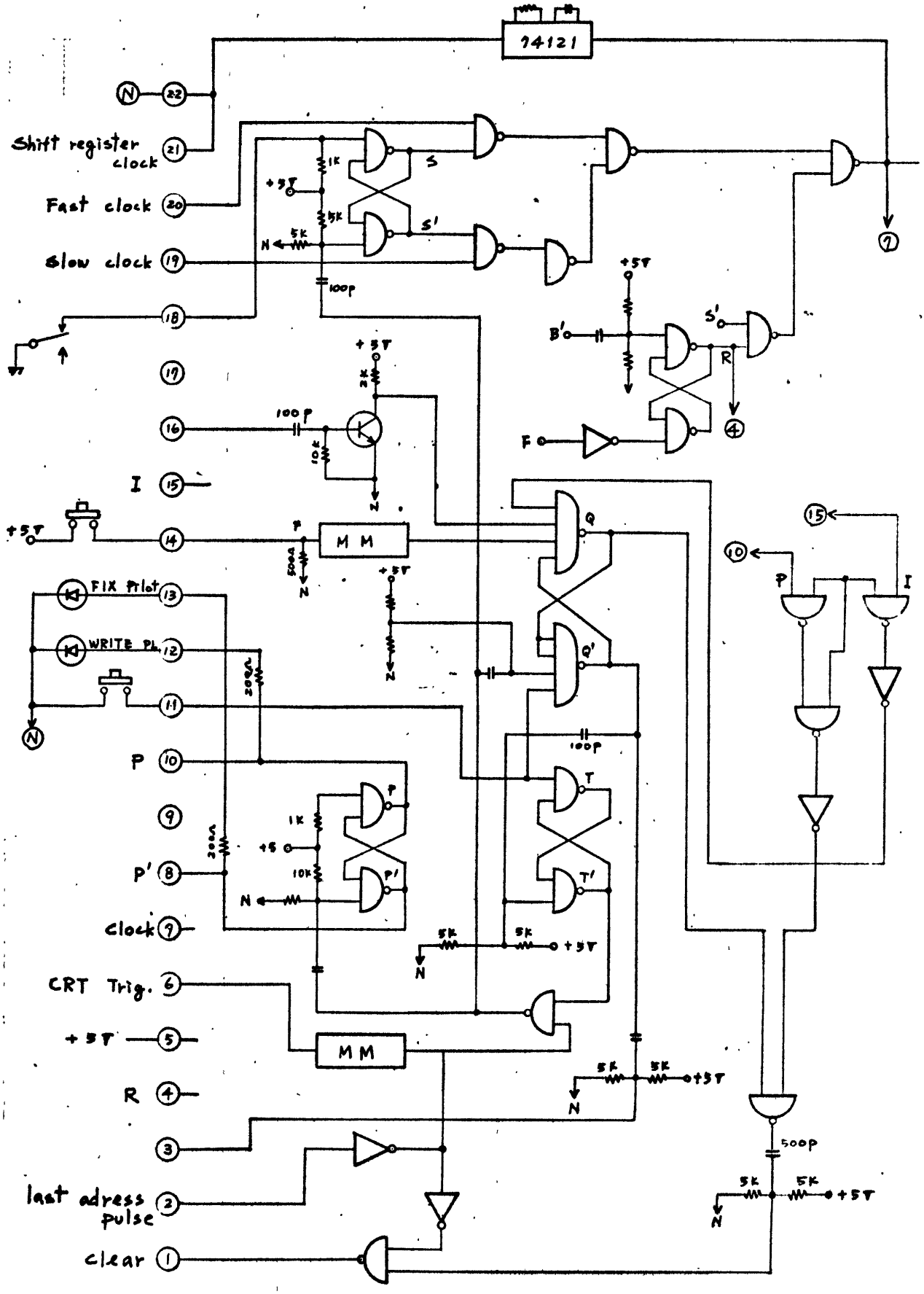

2.4MHz
2K
2K
0.1μ
1K
1K
200P
680
680
200P
20P
A-D Converter
1/2
Recording time unit
7492
7490
7490
7490
7490
7492
7490
1/2 7473
1/2 7473
1/2 7473
1/2 7473
1/2 7473
1/2 7473
Fast clock
Range
5 μsec.
10 "
25 "
50 "
100 "
250 "
500 "
1 msec.
2.5 "
5 "
10 "
25 "
to A-D Converter Clock
5 msec.
10 "
25 "
50 "
100 "
Slow clock
5μ Sampling
Sampling time unit


6MHz
2K
2K
0.1
1K
1K
N
A-D Converter
1/2
Recording time unit
7492
7490
7490
7490
7490
7492
7490
1/2 7473
1/2 7473
1/2 7473
1/2 7473
1/2 7473
1/2 7473
Range
2 μSec.
4 "
10 "
20 "
40 "
100 "
200 "
400 "
1 mSec.
2 "
4 "
10 "
to A-D Convertor Clock
5 mSec.
10 "
20 "
50 "
100 "
Slow clock
2μ Sampling
Sampling time unit

TC Counting unit

P-314G

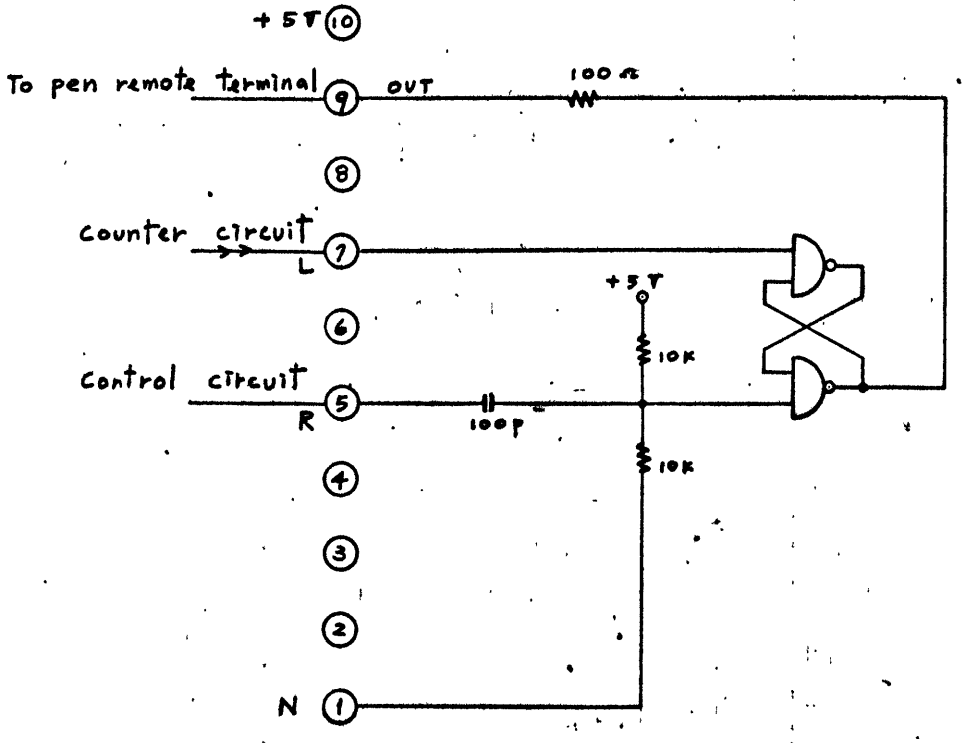


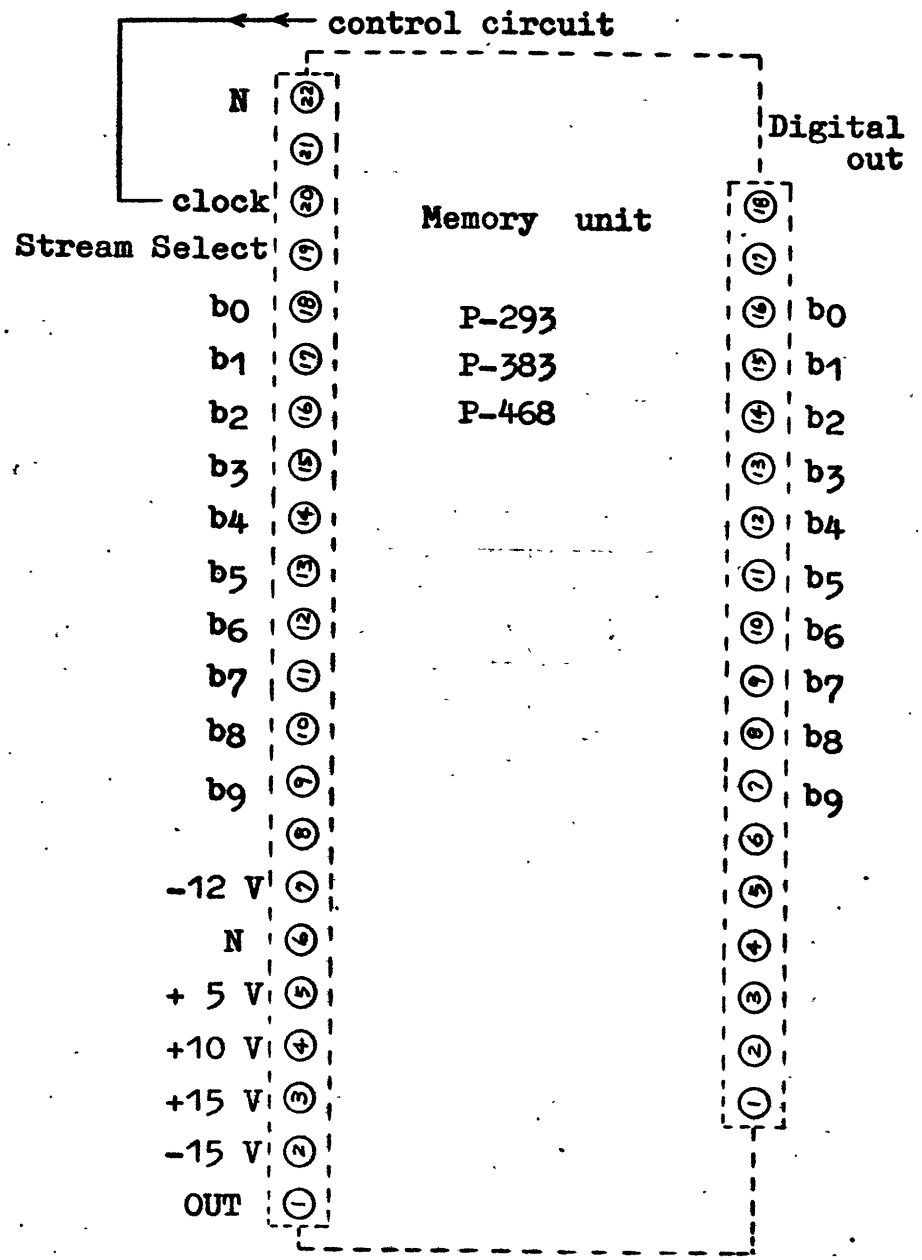


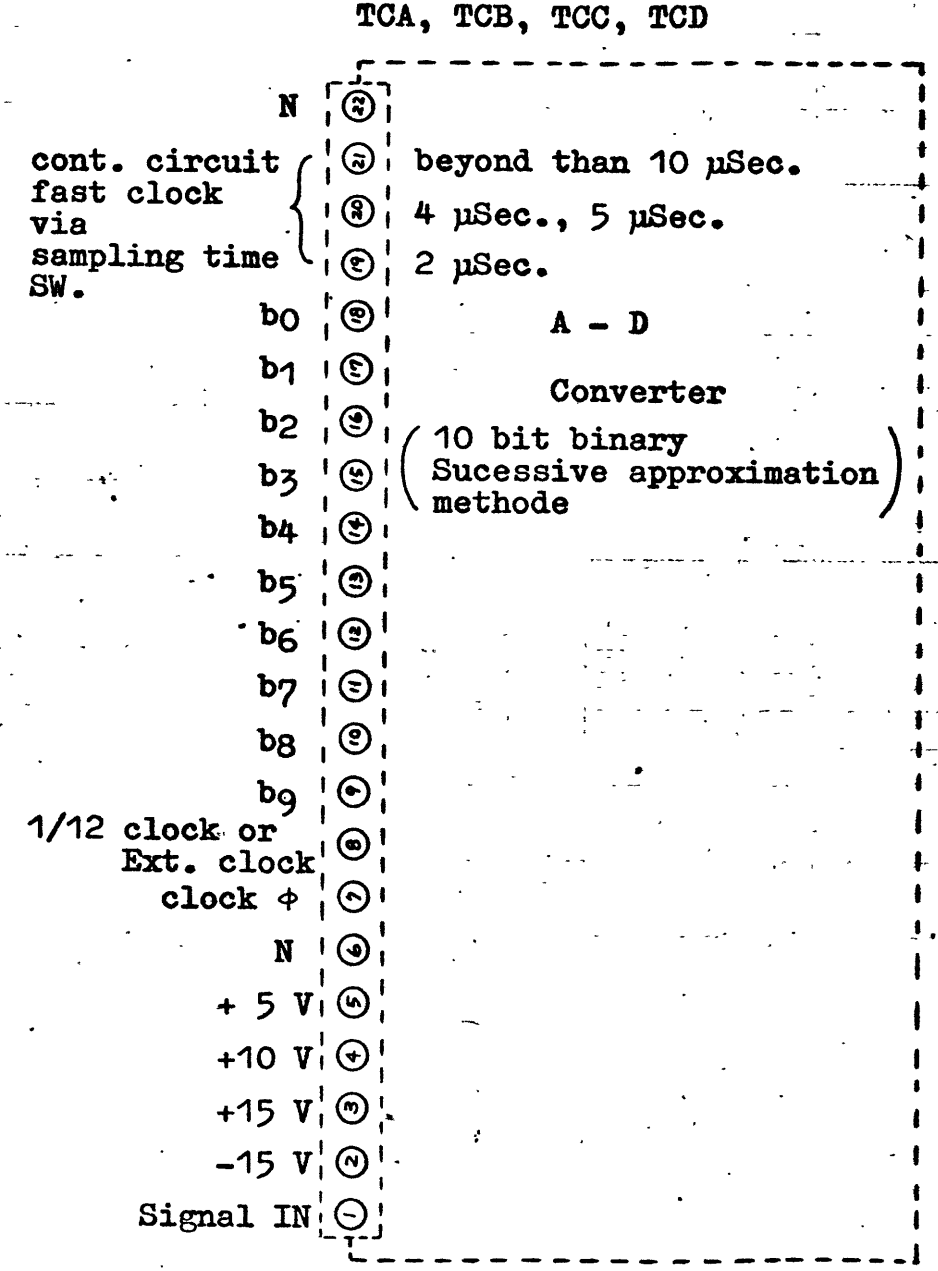
Control circuit

P-293M

Pen Up - Down Circuit P-411




control circuit
N
clock
Stream Select
b0
b1
b2
b3
b4
b5
b6
b7
b8
b9
-12 V
N
+ 5 V
+10 V
+15 V
-15 V
OUT
Memory unit
P-293
P-383
P-468
Digital out
b0
b1
b2
b3
b4
b5
b6
b7
b8
b9

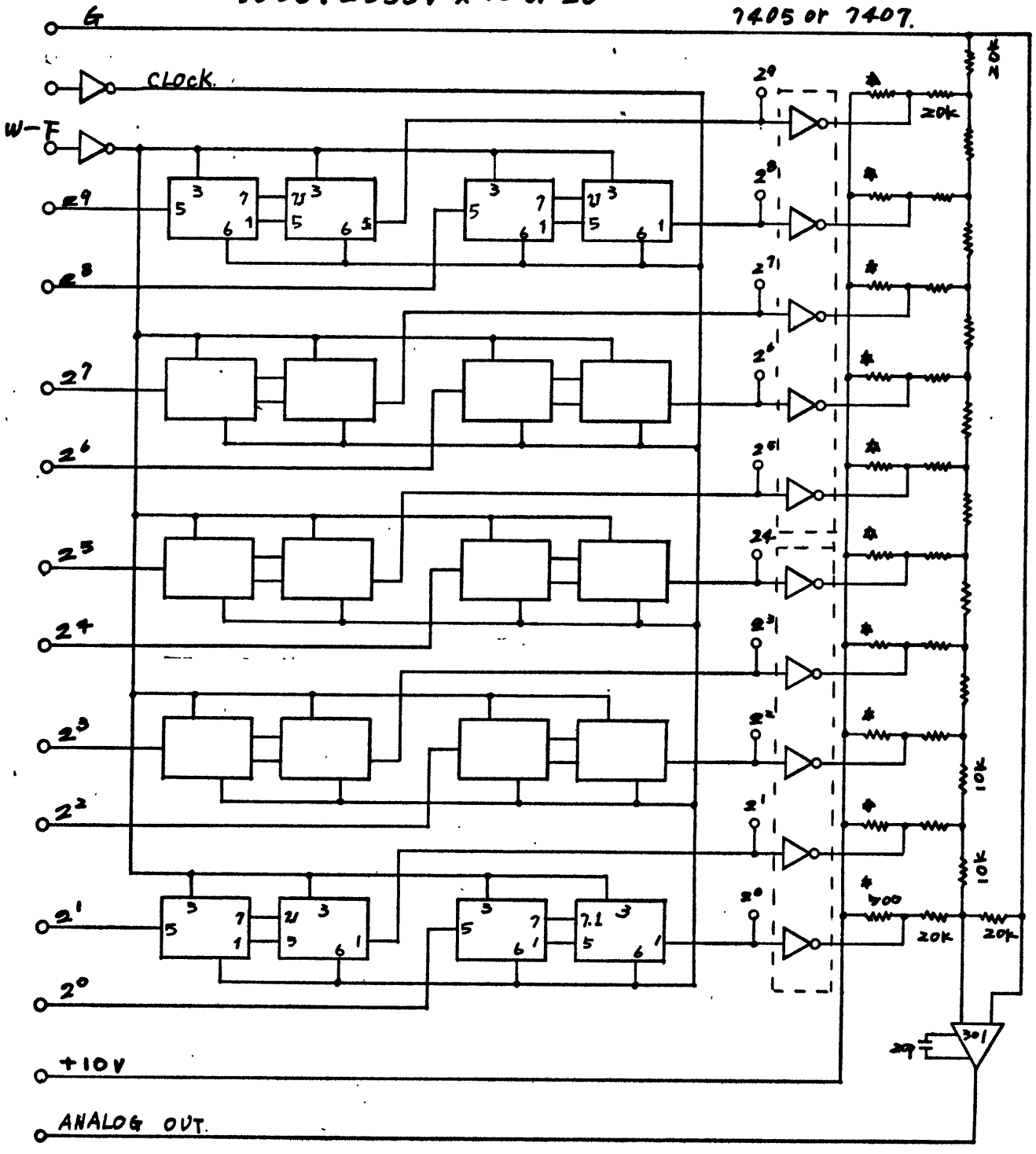

TCA, TCB, TCC, TCD
N
cont. circuit
fast clock
via
sampling time
SW.
beyond than 10 µSec.
4 µSec., 5 µSec.
2 µSec.
b0
b1
b2
b3
b4
b5
b6
b7
b8
b9
A - D
Converter
(10 bit binary
Sucessive approximation
methode)
1/12 clock or
Ext. clock
clock ϕ
N
+ 5 V
+10 V
+15 V
-15 V
Signal IN

MEMORY (10 Bit) (1 M Hz)

1024 - P-468. A . P-294D.
2048 - P-383. A

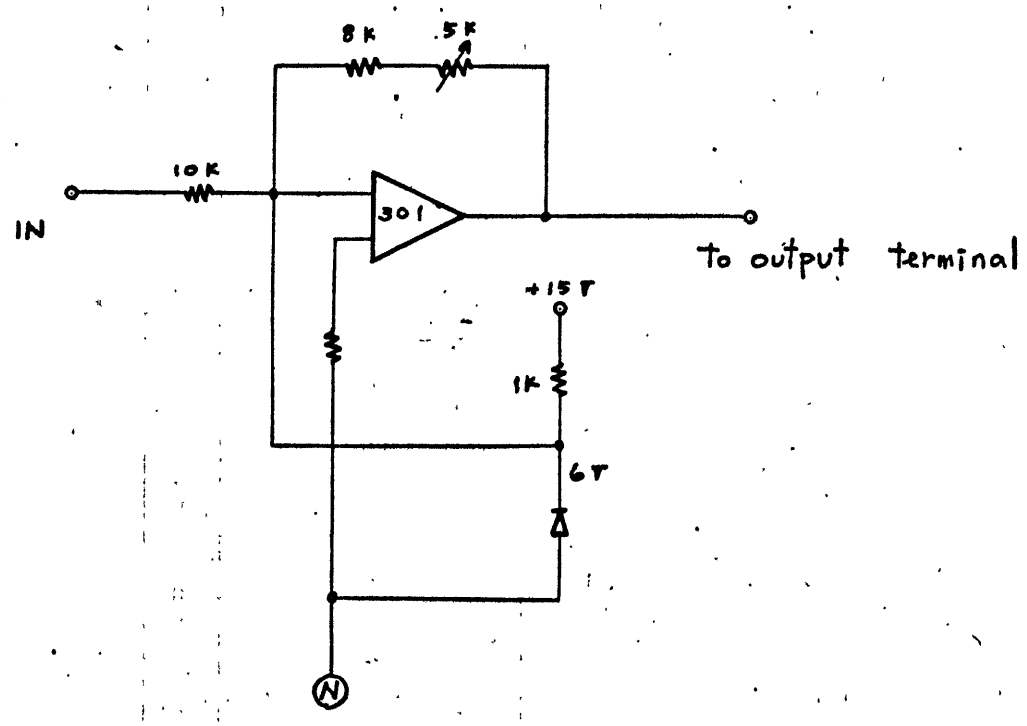
5058. 2533 V x 10 or 20

7405 or 7407.

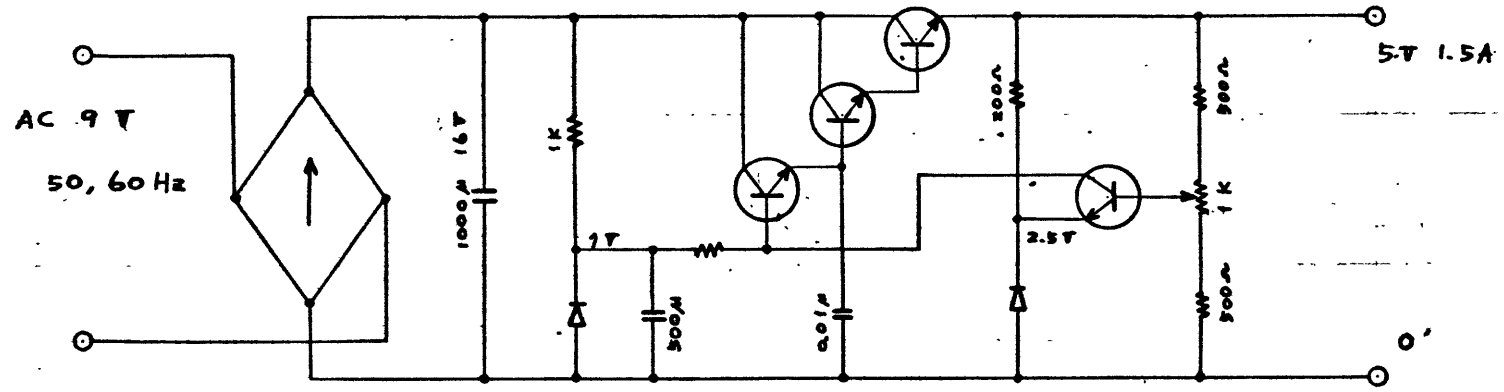


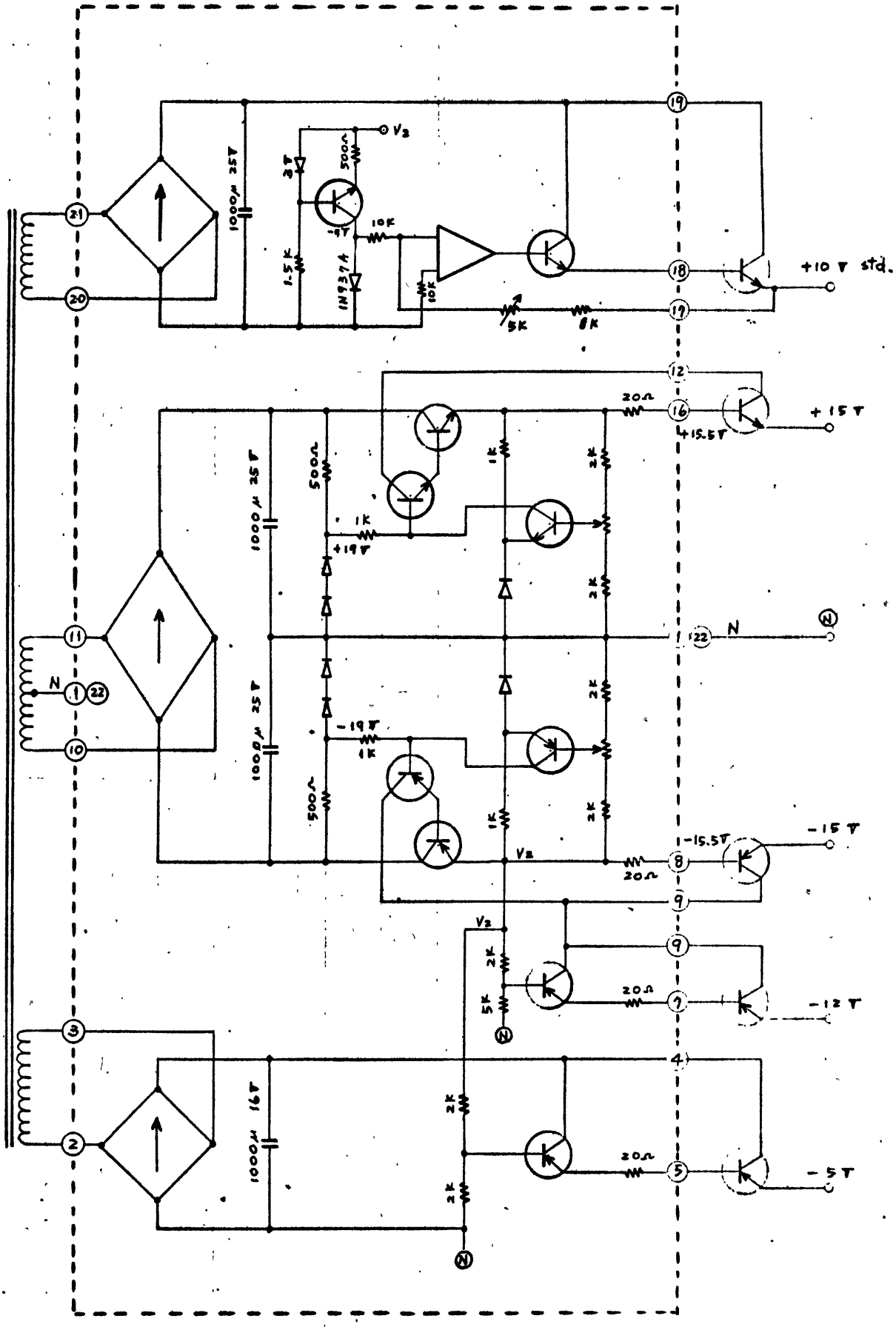
Zero Shift

P-295 A



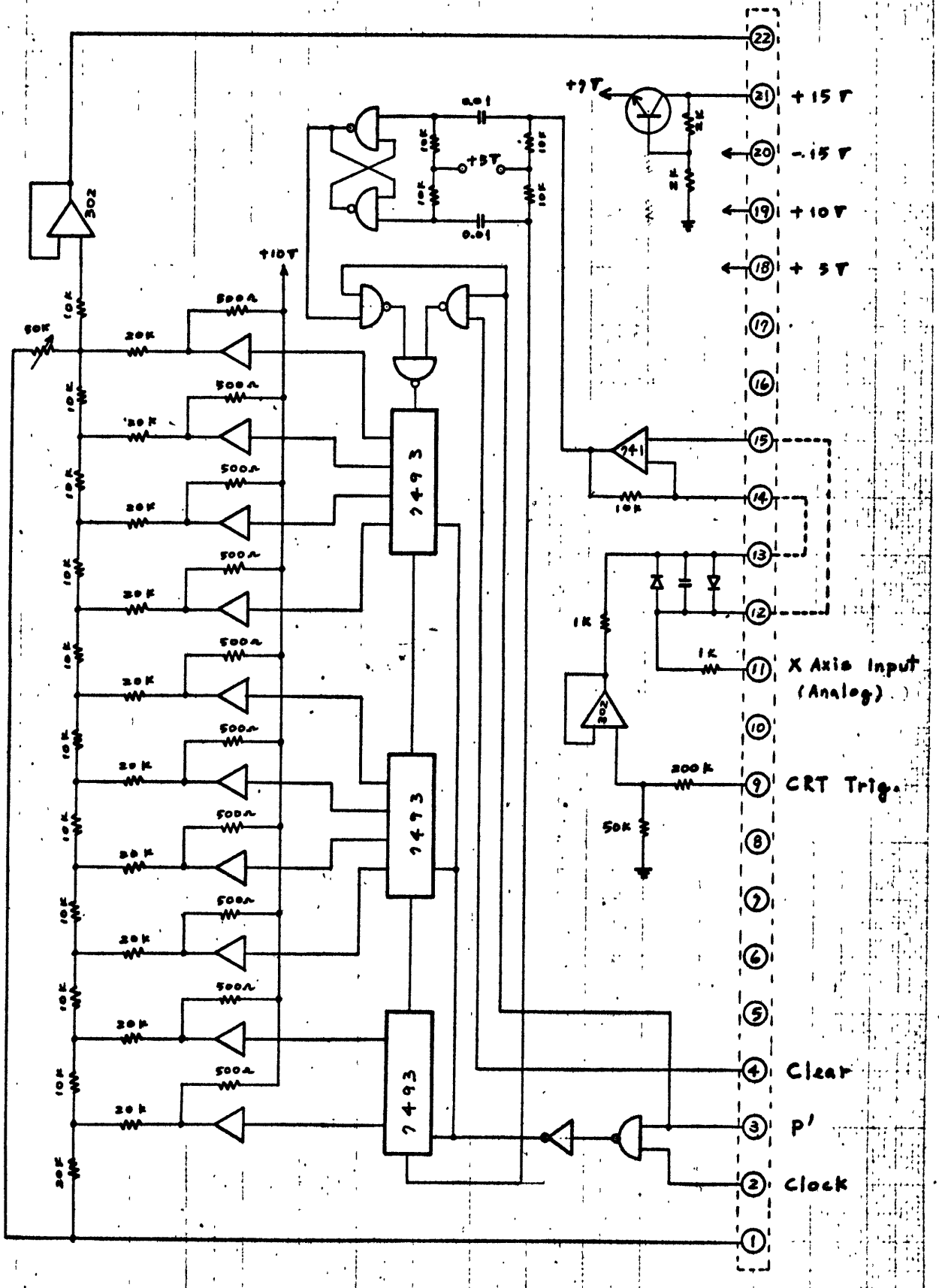
DC POWER SUPPLY for Digital IC P-212C



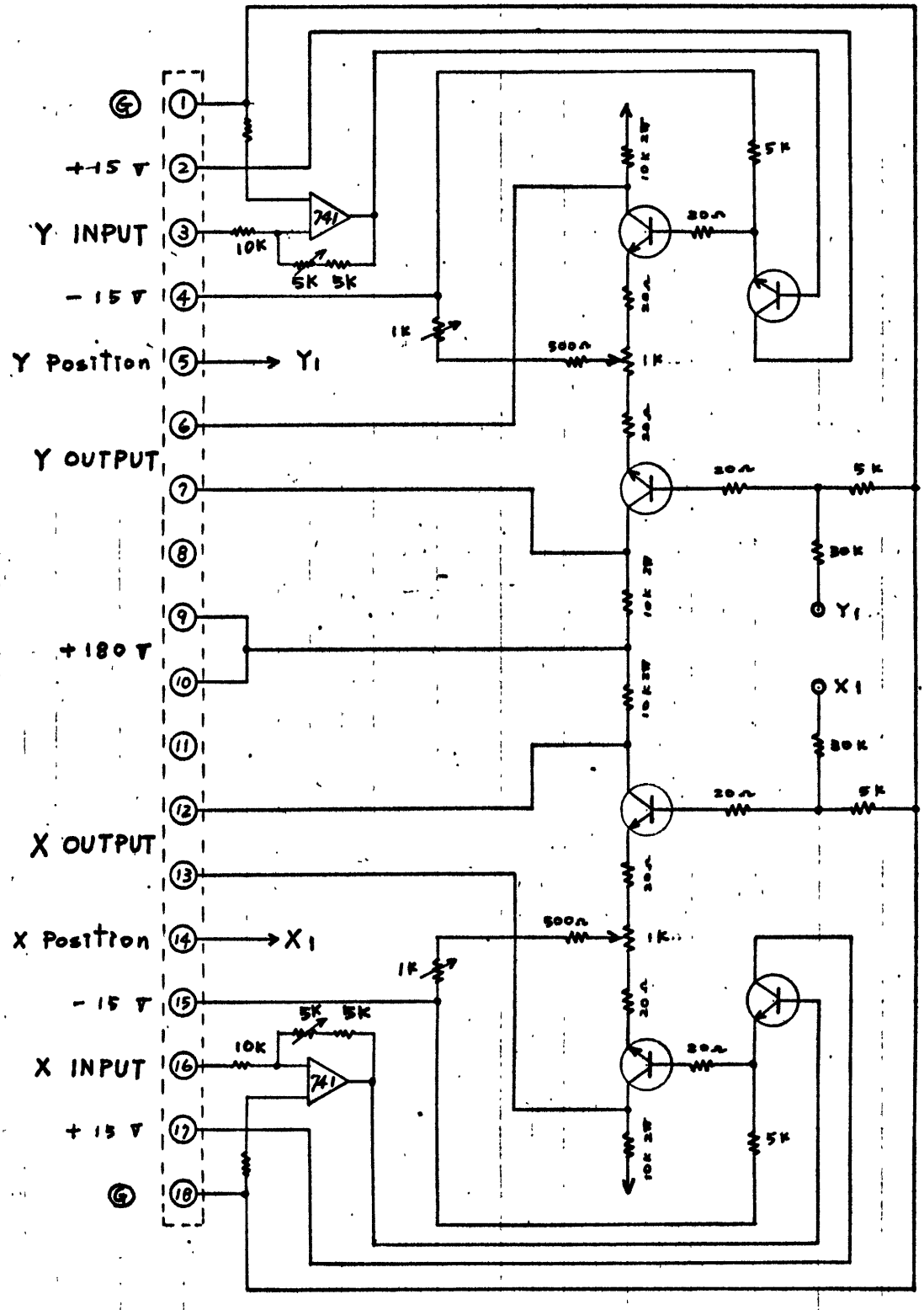


P-292 B.C
CIRCUIT DIAGRAM

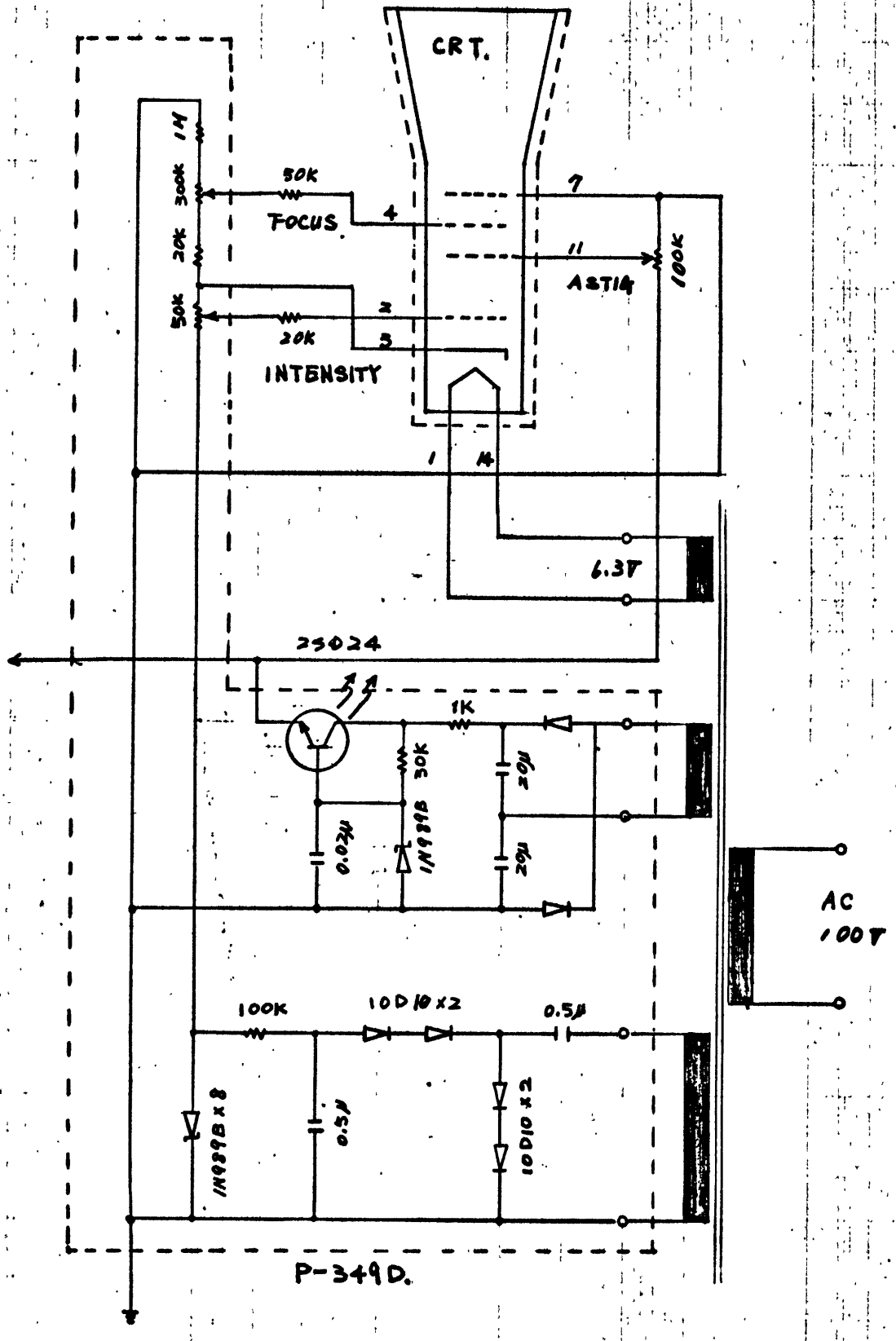
P-352A X Axis Generator



P-311A CRT Amplifier

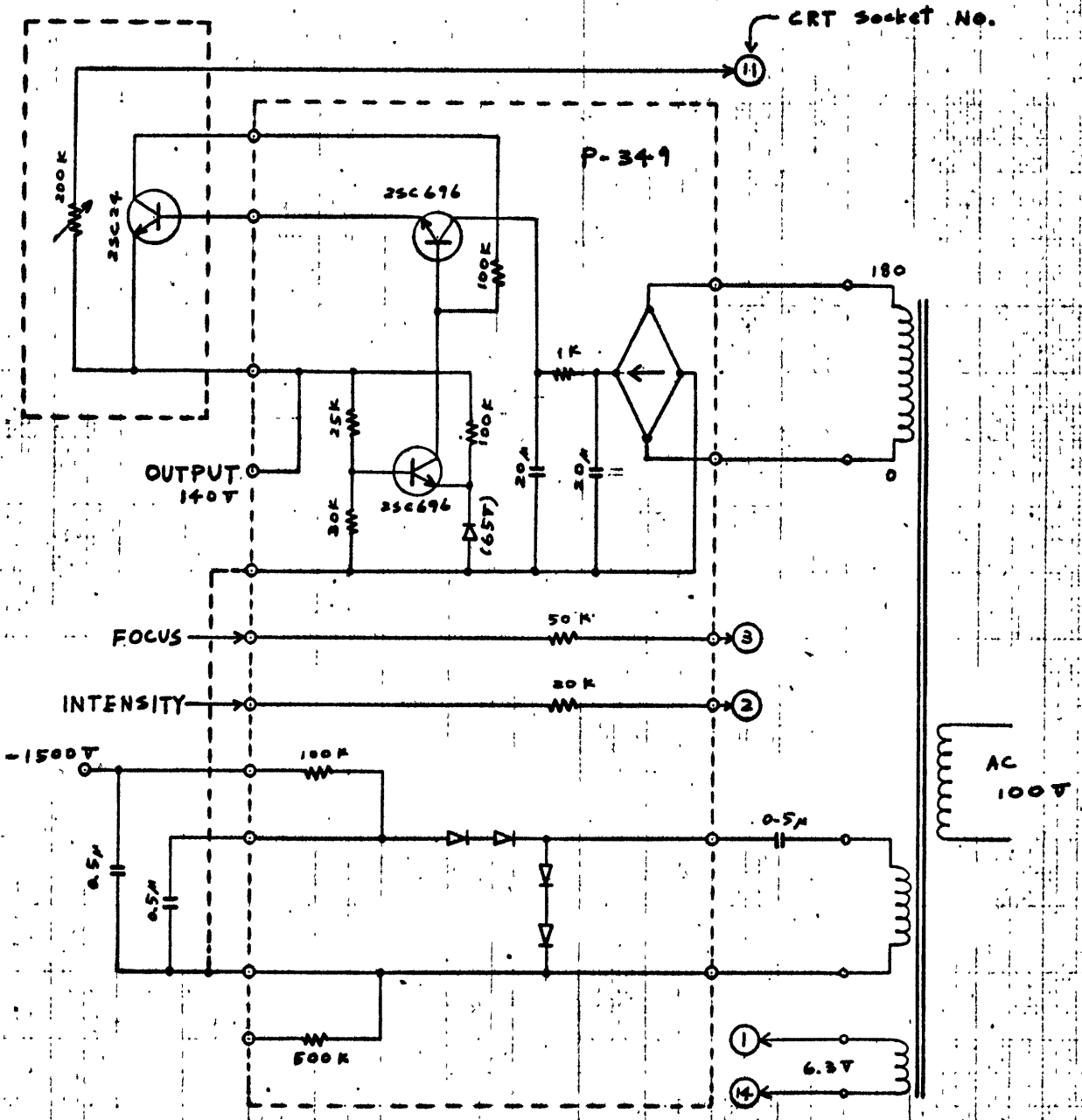


P-349 D Power Supply.



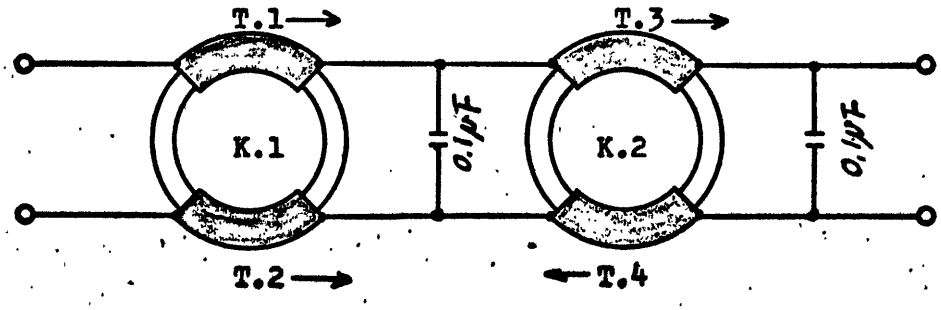
P-349 Power Supply

(CRT use)



RIKEN DENSHI Co., Ltd. No._____

Model Name	S V G - 123.3C	Section	A.C Line Filter



K.1

T.1 : 0.5$^{\phi}$ 20T.

T.2 : 0.5 20T.

K.2

T.3 : 0.5 40T.

T.4 : 0.5 40T.